MARCH, 1957

modern castings

The Bonus Section:
REVOLUTION IN PATTERNMAKING

Owned by THE MEN WHO BUY

We Owe Our Success to CO_2
Military casting made using CO_2 cores and molds spelled success for a new non-ferrous operation

Grinding Wheel Economy
Part 2 – Savings through study of work pressure and wheel selection

Problem Solving with Mg
Magnesium parts were the answer to weight and production problems

Cooling Hot Shot For Shell
Shot is an ideal backing for shell molds–if you learn to handle it

Spray Speeds Die Casting
Bendix Foundries found savings in using colloidal graphite die lube

Diversify and Grow
Texas outfit grows by going into new fields of foundry production

future meetings and exhibits

MARCH

4-6 . . Association of Iron & Steel Engineers, *Fourth Annual Western Meeting. St. Francis Hotel, San Francisco, Calif.*

11-15 . . Nuclear Congress, *Convention Hall, Philadelphia.*

13-14 . . Foundry Educational Foundation, *Annual College-Industry Conference. Hotel Cleveland, Cleveland.*

15-16 . . AFS California Regional Foundry Conference, *Sponsored by the Northern California and Southern California Chapters of AFS. Claremont Hotel, Berkeley, Calif.*

18-19 . . Steel Founders' Society of America, *Annual Meeting. Drake Hotel, Chicago.*

23-28 . . American Society of Tool Engineers, *Silver Anniversary Technical Meeting and Convention. Shamrock Hilton Hotel, Houston, Tex.*

25-29 . . American Society for Metals, *Tenth Western Metal Exposition and Congress, to run concurrently with Titanium Conference. Pan-Pacific Auditorium, Los Angeles.*

APRIL

9-11 . . American Welding Society, *Welding Show. Convention Hall, Philadelphia.*

10-11 . . Malleable Founders' Society, *Market Development Conference, Edgewater Beach Hotel, Chicago.*

11 . . Association of Lift Truck & Portable Elevator Manufacturers, *Spring Meeting, Edgewater Beach Hotel, Chicago.*

12-13 . . AFS East Coast Regional Foundry Conference, *Sponsored by the Philadelphia, Metropolitan and Chesapeake Chapters. Benjamin Franklin Hotel, Philadelphia.*

29-May 3 . . 7th National Materials Handling Conference, *Convention Hall, Philadelphia.*

29-May 4 . . The Institute of Metals . . *Joint Spring Meeting with Associazione Italiana di Metallurgia, the Societe Suisse des Constructeurs de Machines, and the Schweiz. Church House, London, England.*

30-May 2 . . Investment Casting Insti-

tute, *Annual Spring Meeting.* Park Sheraton Hotel, Washington, D. C.

MAY

6-10 . . American Foundrymen's Society, *The 1st Engineered Castings Show, Music Hall, and The 61st Castings Congress, Netherlands-Plaza Hotel, Cincinnati.*

12-16 . . The Electrochemical Society, Inc., 111*th Meeting. Hotel Statler, Washington, D. C.*

14-16 . . Armour Research Foundation of Illinois Institute of Technology and Nucleonics Magazine, *Industrial Nuclear Technology Conference, Museum of Science & Industry, Chicago.*

JUNE

11-13 . . Small Business Administration, *Third Western Plant Maintenance Show and Conference. Civic Auditorium, San Francisco.*

13-14 .. AFS Chapter Officers Conference. *Sherman Hotel, Chicago.*

13-14 . . Malleable Founders' Society, *Annual Meeting, The Broadmoor, Colorado Springs, Colo.*

16-21 . . American Society for Testing Materials, *Annual Meeting. Chalfonte-Haddon Hall, Atlantic City, N. J.*

20-22 . . 2nd Annual AFS Foundry Instructors' Seminar, *Kellogg Center, Michigan State University, East Lansing, Mich.*

20-22 . . Penn State Regional Foundry Conference, *Sponsored by the Rochester, Pittsburgh, Metropolitan, Eastern New York, Western New York, Northwestern Pennsylvania, Central New York, Chesapeake and Philadelphia Chapters, and the Penn State University Student Chapter of the American Foundrymen's Society and the Reading Foundrymen's Assn. and Conestoga Foundrymen's Assn. Penn State University, University Park, Pa.*

22-25 . . Alloy Casting Institute. *Annual Meeting. The Homestead, Hot Springs, Va.*

27-28 . . Refractories Institute, *Annual Meeting. Greenbrier, White Sulphur Springs, W. Va.*

AUGUST

19-24 . . Swedish Foundrymen's Association, and Sveriges Mekanforbund, *24th International Foundry Congress, Parliament Bldg., Stockholm, Sweden.*

SEPTEMBER

17-20 . . American Die Casting Institute, *Annual Meeting. Edgewater Beach Hotel, Chicago.*

AFS Training and Research Institute Starts Program

B. C. Yearley named to complete line-up of trustees

■ Appointment of B. C. Yearley as a truste of the American Foundrymen's Society's Training and Research Institute completes the slate of industry leaders named to aid the society in advancing educational and scientific objectives.

Yearley is assistant to the operating vice-president of National Malleable & Steel Castings Co., Cleveland, Ohio. He is a graduate of Case Institute and has served National Malleable in various capacities since joining as a foundry trainee in 1923.

From 1926-53 he was employed in Chicago by National Malleable and in 1952 was named as a director for the AFS Chicago Chapter. He has presented papers at conventions and addressed many AFS chapters. At present he is a member of the Malleable Division Advisory Group and chairman of that division's round table sub-committee.

A series of one-week intensive training courses for foundry employees will be initiated this fall by the AFS Training and Research Institute. Present plans are to conduct courses in three Midwest localities: Rackham Memorial Building, Detroit; Marquette University, Milwaukee, Wis.; and one of the major Chicago technical colleges.

Plans call for one or two sessions at Marquette on industrial engineering and time study methods. A series of seven intensive sand courses are planned at the Detroit technical center. The Chicago courses will cover ferrous melting practice and demand for attendance will govern the number to be offered.

All courses will be of one week duration, Monday to Friday, and admission fees sufficient to cover expense of the meetings will be charged. The courses are under the direct preparation and supervision of the AFS Institute, of which H. Bornstein, former director of laboratories of Deere & Co., Moline, Ill., is chairman.

Individuals and companies are urged to register early for the various courses which are scheduled to begin in August. Attendance will be limited at most of the courses to 25. At least one of the sand courses, it is planned, will permit attendance up to 200.

Registrations and inquiries should be addressed to S. C. Massari, Director of the Training and Research Institute, AFS Headquarters, Des Plaines, Ill.

CIRCLE NO. 123, PAGE 7-8

march, 1957
vol. 31, no. 3

modern castings

in this issue

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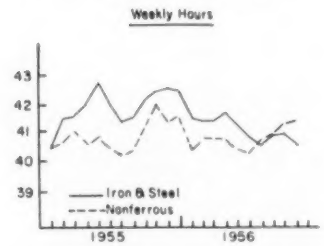
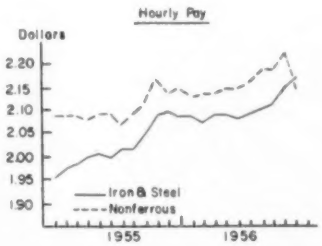
On The Management Side

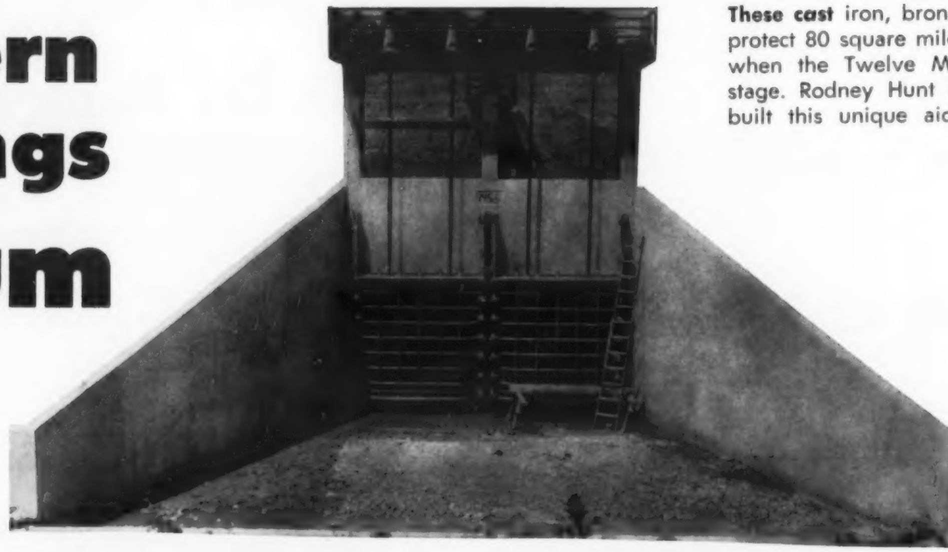
■ **Bargaining Trends in the Foundry Industry.** The National Foundry Association has summarized the most significant trends in collective bargaining settlements in the foundry industry during 1956. As a result of their survey they found that most of the foundries reported agreements to wage increases ranging from 8 to 12 cents, with 10 cents as the average. Increased hospitalization and surgical benefits, increased vacations, and an additional holiday, were the most frequent fringe benefits granted. The most significant development of 1956 was the movement toward long-term agreements. Over two-thirds of the foundry agreements were for two or three years. In the two-year contracts there is either a povision for a 6 or 7 cent increase due in 1957 or a wage reopener. The three-year agreements follow a similar pattern. Contracts were improved by clarifying and tightening existing contacts language and by revamping seniority clauses to allow for more efficient plant operations. Certain current labor trends are portrayed in the charts below, prepared by the U.S. Bureau of Labor Statistics.





■ **1954 Census of Gray Iron Foundries.** Final tabulation by the Bureau of Census shows that 8,392,620 tons of gray iron castings valued at over \$1½ billion were shipped in 1954. This is one million less tons than were shipped in 1947, the principle decrease being in railroad car wheels. However, the value added by manufacture (derived by subtracting cost of materials etc.) rose to \$846 million in 1954, an increase of 15 per cent over 1947. This increase was not consistent throughout the country. Decreases were reflected in the totals for the states of Connecticut, New York, Pennsylvania, Indiana, Illinois, and Wisconsin. Higher productivity resulting from technological advancement and mechanization are reflected in the 23 per cent drop in average employment. A total of 1413 gray iron foundries reported 133,884 employees. Texas was the only state showing an increase in foundry employees when compared with 1947. In order to make the shipments figures comparable to current statistics being tabulated every month by the Bureau of Census it is necessary to add the weight of castings produced and used in the same plant. This adjustment brings total shipments up to 10,403,620 tons for 1954. Shipments were considerably improved in 1955 with the total exceeding 14,838,000 tons and 1956 (estimated) dropping a little to 14,000,000. With automobile production on the upswing, the highway building program increasing the needs for heavy construction machinery, and the boom in mechanical handling equipment, gray iron foundries should go over the 15 million ton mark in 1957.

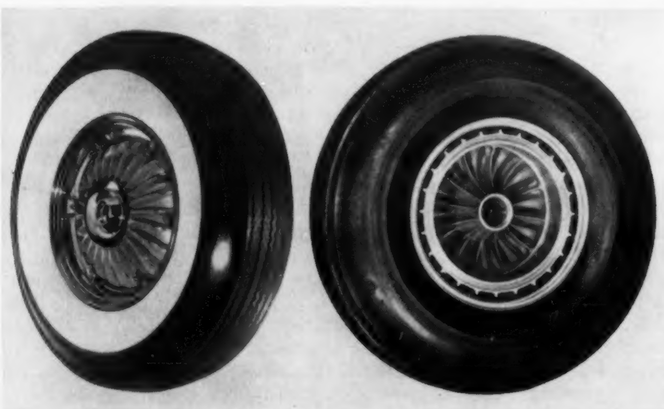
modern castings album



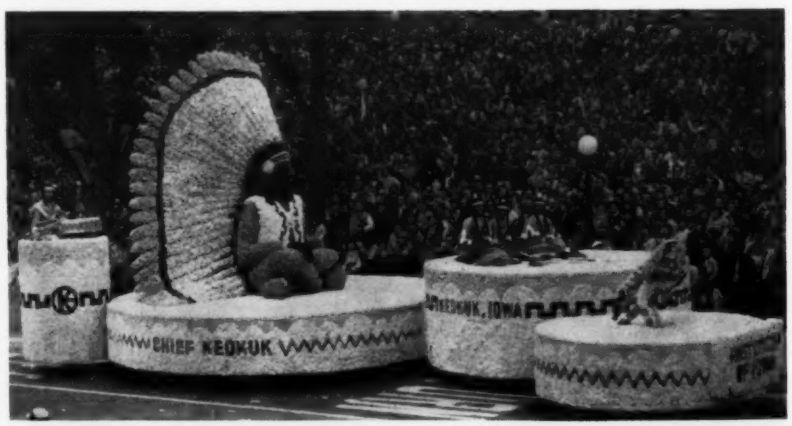
These cast iron, bronze mounted sluice gates now protect 80 square miles of rich Louisiana farm land when the Twelve Mile Bayou reaches the flood stage. Rodney Hunt Machine Co., Orange, Mass., built this unique aid to Louisiana flood control.

Baby chapter of AFS, the Utah Chapter, gets its official send-off as AFS General Manager Wm. W. Maloney presents the rattle to Chairman Arthur S. Klopf, chairman of the society's newest chapter.

Big wheels, headed by AFS President Frank W. Shipley, were all on hand to welcome the new Utah Chapter and its 101 charter members into the national group in a ceremony at Salt Lake City, January 21.



Better wheels for autos will be die cast aluminum if Kaiser Aluminum design is accepted. Wheel is die cast in integral unit including hub and brake drum, for improved braking, greater strength and lighter weight. Braking surface may be a cast-in iron liner.



Chief Keokuk rode a prize-winning floral float in the New Year's Day Pasadena Tournament of Roses parade. Float represented Keokuk, Iowa, industries including Keokuk Electro-Metals Co. This firm's advertising has made the chief a familiar figure in MODERN CASTINGS.

Los Angeles Firm Conducts Pattern, Casting Seminar

To promote a better understanding of pattern and casting problems, U. S. Electrical Motors, Inc., Los Angeles, conducted three, one-day seminars in October. Seventy-five persons attended these sessions. W. G. Stenberg, U. S. Electrical Motors supervisor of metals, was the speaker.

Discussions started with drawing board considerations such as proper radii, elimination of loose pieces, core problems and the importance of sufficient draft. Terminology was also discussed. Simple loose patterns were demonstrated at first and the talks proceeded to more complex problems. Demonstrations were made on multiple patterns and how a cast-in plate pattern was produced. The necessity of cores was explained and how alterations could be made in coring to cut time and labor.

Approximately 25 patterns were shown ranging from 2 in. in diameter to 4 ft high. Several actual molds were displayed. Explanations were also given on parting line problems including their correct location. Blackboard illustrations supplemented the lectures and used to point out the need for various amounts of draft and the requirement for core prints.

In addition to the step by step demonstration of basic casting problems other techniques and methods were discussed. These included core blowing, shell molding, investment casting, centrifugal casting, and permanent molding.

To Hold Pattern School

Chicago patternmaker employers, graduate apprentices and journeymen are invited to attend a one-day school on the use of plaster and plastics in patternmaking. The school will be sponsored three days, March 7-9 by United States Gypsum Co. at its training center in Chicago. Instructions will be repeated daily.

The program will consist of a discussion of physical properties and characteristics and materials needed for patternmaking as well as demonstrations and student participation. An exhibit will be shown of applications of gypsum cement in the automotive, aircraft, plastics and foundry industries.

Answer questions by sending for data describing the newest products and processes. Order now by using the cards on **page 7-8.**

CIRCLE NO. 124, PAGE 7-8

products and processes

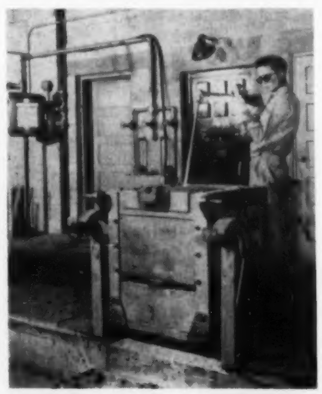
Iron powder hard facing electrodes come in three styles, welder said able to deposit 100 lb of weld material in 3/4 of time required with build-up and hard facing electrodes. *Alloy Rods Co.*

CIRCLE NO. 1, PAGE 7-8

Partial radiation optical pyrometer operates on built-in storage battery with range of 1300 to 6300 F. Parts enclosed in dust-proof housing. *Epic Inc.*

CIRCLE NO. 2, PAGE 7-8

Temperature checking system measures melting points of newer metals whose melting points are not accurately known. System uses lightweight immersion thermocouple and portable electronic indicator or permanently mounted recorder. Assists in cutting waste due to faulty castings, saves fuel burned in overheating melts and aids in quality control. Used to determine exact "freezing" point of new melt, indicates when melt reaches pouring temperature and checks temperatures at various shop locations. Readings made on indicator or chart recorder. *Leeds & Northrup Co.*



CIRCLE NO. 3, PAGE 7-8

Vacuum cleaner, air-operated, for industrial applications is designed for wet and/or dry applications. Comes in 30 and 55 gal capacities in four models. *Vac-U-Max Sales Co.*

CIRCLE NO. 4, PAGE 7-8

Electric band saw, portable, is said to cut most metals using ½-hp motor.

Designed for cut-off work in foundries and pattern shops. Cuts rectangular stock to 3¼ in. x 4¼ in. and round stock up to 3¼ in. in diameter. *Porter-Cable Machine Co.*

CIRCLE NO. 5, PAGE 7-8

Hook scale, has hydraulic diaphragm and 360 deg hook rotation. Accuracy

claimed within ¼ of 1 per cent of capacity at any point. Scale for 10,000 lb capacity weighs 73 lb. *Martin-Decker Corp.*

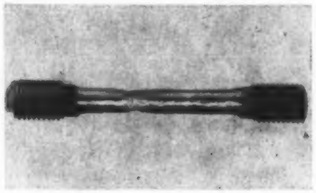
CIRCLE NO. 6, PAGE 7-8

Floor cleaning machine brush attachment loosens sticky materials or powder film residue so they can be lifted. May be used in either forward or

backward motion. *Handling Devices Co., Inc.*
CIRCLE NO. 7, PAGE 7-8

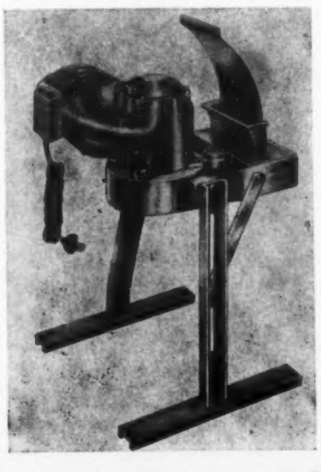
Hardness tester, automatic, tests to 1000 pieces per hr, sorting into three groups. Also has counter and safety stop if pieces do not feed. Single tests may also be performed. *Wilson Mechanical Instrument Div., American Chain & Cable Co., Inc.*
CIRCLE NO. 8, PAGE 7-8

Stainless steel alloy, developed at Ohio State University's corrosion research laboratories as part of research



program of Alloy Casting Institute is said to have better mechanical properties than "18-8" stainless steels. Type "CD-4MCu" is composed of 25-27 per cent chromium, 4.75-6.00 per cent nickel, 0.04 per cent carbon, 1.75-2.25 per cent molybdenum, 2.75-3.25 copper and 1 per cent each of silicon and manganese. *Alloy Casting Institute.*
CIRCLE NO. 9, PAGE 7-8

Scrap metal chopper cuts coil and strip stock for economical collection and storage. Has one moving part, may be tipped at angle to suit feed-



ing material. Operates on 1/3 hp, 115/230 v, single phase, 60 cycle drive. *Cooper Weymouth, Inc.*
CIRCLE NO. 10, PAGE 7-8

Temperature controller, differential expansion type handles from 0 to 2000 F. Comes in three models with

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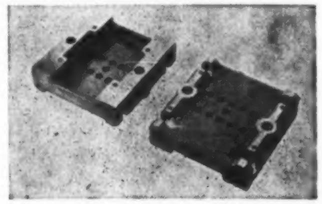
Please use card before September 1, 1957

adjustable ranges as wide as 1200 deg. *Burling Instrument Co.*
CIRCLE NO. 11, PAGE 7-8

Steel rack has stacking legs for fork truck handling, accommodates wire baskets. Unit is 36 in. high, 32 in. wide and 28 in. deep. Eliminates pallets, may be stacked. *Jaxon Wire Products.*
CIRCLE NO. 12, PAGE 7-8

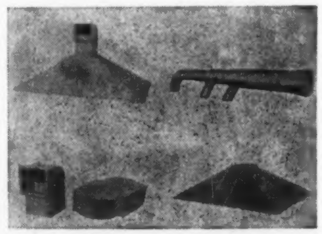
Ejector box for air operated "DCMT" die casting machines. Permits ejection



over complete area of die block to maximum size of 9 x 9 in. *British Machine & Foundry Supplies, Ltd.*
CIRCLE NO. 13, PAGE 7-8

Electrode control regulator for arc furnaces is said capable of driving electrodes at speeds and responses up to limit of drive motor due to magnetic amplifiers. Commutating ability of motor limits electrode speed and response that can be furnished by control. *Westinghouse Electric Corp.*
CIRCLE NO. 14, PAGE 7-8

Plastic fume ducts and hoods are said to be chemical-resistant, lightweight and flexible. Withstand temperatures to 300 F. Light weight keeps installation time low with only



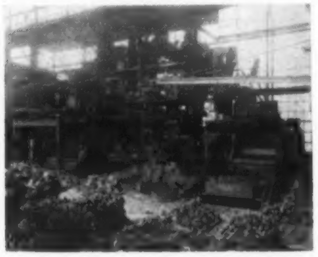
simple overhead support necessary. Ducts and hoods may be made to nearly any shape. *Ceilcote Co., Inc.*
CIRCLE NO. 15, PAGE 7-8

Die-closing, wax injection press for semi-automatic production of wax patterns for investment casting, withstands injection pressure of 600 psi. Platens accommodate dies 6 in. high, 12 in. square. Operates in four steps: platen closes on mold; die-closing press and table move forward to contact spring-loaded nozzle; nozzle kept

open during injection and dwell time; platen retracts and opens to allow removal of mold. *Sherwood Metal Products Co.*

CIRCLE NO. 16, PAGE 7-8

Steel shot abrasive, heat treated, reduced abrasive cost per ton by 50 per cent at Unitcast Corp. Toledo, Ohio. One plant cleans 84 tons of



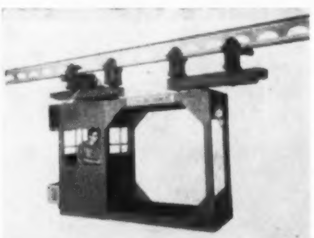
castings daily using three airless abrasive blast cleaning machines. Can clean castings for 57 cents per ton. *Wheelabrator Corp.*

CIRCLE NO. 17, PAGE 7-8

Hand trucks and dock boards of aluminum are light weight, cut maintenance time. Truck platform has rounded corners and adjustable wheel base, widths from 24 to 40 in. and lengths 36 to 72 in. with 2000 lb capacity. Boards have safety tread and beveled approach edges with safety stops. *Voltz Bros., Inc.*

CIRCLE NO. 18, PAGE 7-8

Conveyor platform and air conditioned cab operated on overhead tramrail. Ladles and hot objects carried on platform which can be



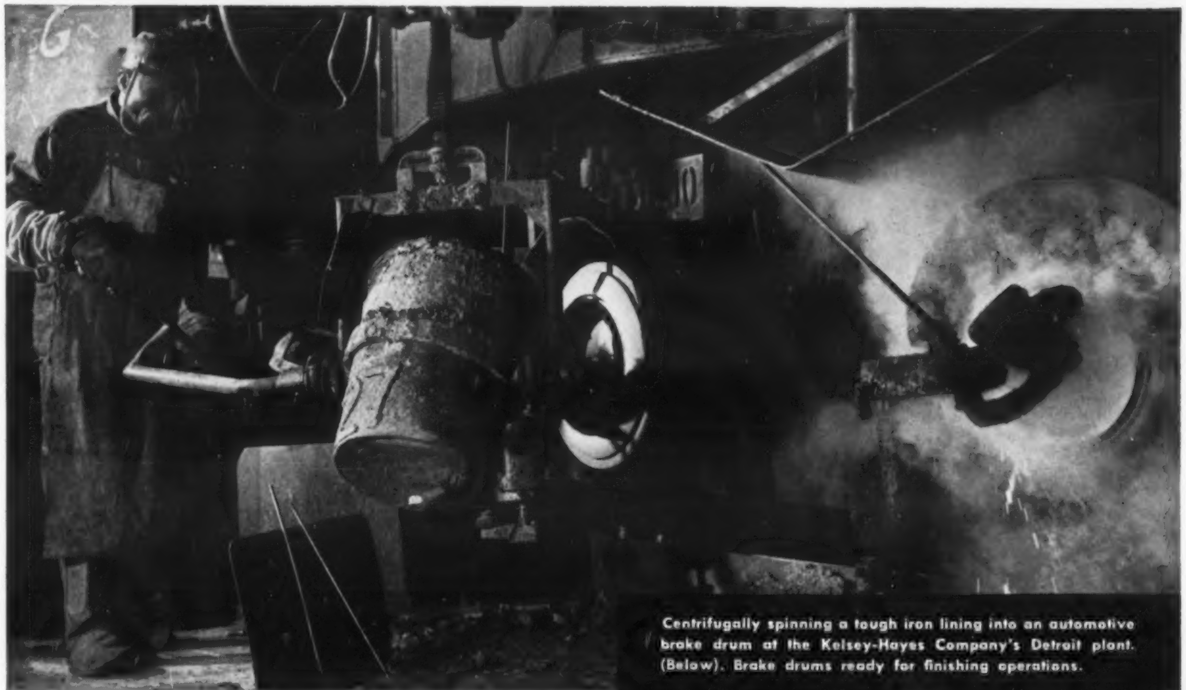
changed in size. Safety switch prevents movement when door is open. ***Cleveland Tramrail Div., Cleveland*** *Crane & Engineering Co.*

CIRCLE NO. 19, PAGE 7-8

Wall paint which absorbs ultraviolet rays reduces harmful effects on eyes in welding areas. Made in Holland, comes in three types and seven colors. *Netherlands Trade Commission.*

CIRCLE NO. 20, PAGE 7-8

Bandsaw for wood and non-ferrous materials has straight "V" belt drive



CIRCLE NO. 126, PAGE 7-8

and a gear reduction permitting cutting range from 50 to 3800 ft per min. Table tilts 10 to 45 deg. *J. D. Wallace & Co.*

CIRCLE NO. 21, PAGE 7-8

Electric furnaces for annealing castings at General Metals Corp., Oakland, Calif. handle 10,000 lb loads. Castings are kept in furnace at 1700

F for 40 hours, then gradually cooled to 1300 F for 18 hours. *Westinghouse Electric Corp.*

CIRCLE NO. 22, PAGE 7-8

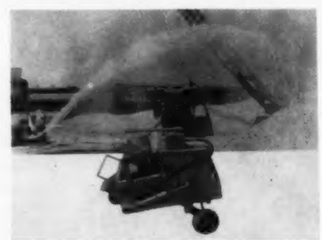
Parallel and V-block fixture supports work on drill presses, benches and surface plates. Jaws grip work 1/8-in. from the bottom, overriding action of jaws locks work rigidly. Vise cleaned by flipping back jaws. Comes in two sizes, openings of 3 and 4 in. *Illinois Metal Products.*

CIRCLE NO. 23, PAGE 7-8

Forced convection furnace for normalizing, tempering, annealing, etc. with and without protective and special atmospheres. Temperature range 250 to 1975 F, heats 2000 lb steel to 1875 F in 3½ hr. Inside dimensions 36x40x72 in. *L&L Mfg. Co.*

CIRCLE NO. 24, PAGE 7-8

Material thrower, portable, for stockpiling, filling bins and aerating, handles 30 to 90 tons per hour. Available



with gasoline engine, electric motor or powered from truck hydraulic system. Unit may be swiveled in operation. *Baughman Mfg. Co.*

CIRCLE NO. 25, PAGE 7-8

Wire rope blocks have end thrust bearings to prevent side frame wear,

CIRCLE NO. 129, PAGE 7-8

cast bead on side frames to prevent fouling of wire rope. Sizes 6 to 18 in. with bronze bearings, 8 to 42 in. with roller bearings. *Sauerman Bros., Inc.*

CIRCLE NO. 26, PAGE 7-8

Hoist and winch, manually operated, in single or double reel models weighing 21 and 29 lb, is designed

for heavy duty lifting, lowering or pulling. Both models contain 30 ft standard ¼-in., 7 x 19 extra flexible high strength aircraft cable. *Multiple Corp.*

CIRCLE NO. 27, PAGE 7-8

Water cooling towers use redwood extensively in structure and fill. Tower casing made of asbestos cement board. Two in series, 7 ft 3 in frame height and 12 ft 1 in frame height. Both are prefabricated. Additional cells added easily. *J. F. Pritchard & Co.*

CIRCLE NO. 28, PAGE 7-8

Lift table, designed to elevate skid or palletized loads up to 4000 lb with a lift of 30 in. Slides between legs of standard skid. Operates on ½ hp, single phase, 115 volt AC, 60 cycle, 1725 rpm motor. *Southworth Machine Co.*

CIRCLE NO. 29, PAGE 7-8

Wet abrasive oscillating cutting machine "Model 481" cuts most metals to 8 in. square solids. Operates on 25 hp motor, 1800 rpm. Wheel feed and work clamps are hydraulically operated, work bar is hand fed. *American Chain & Cable Co., Inc.*

CIRCLE NO. 30, PAGE 7-8

Heat treating furnaces, electric or gas, for use, 250 to 1750 F. Combines radiation and pressure blower convection heating methods. Performs hardening, normalizing, tempering, annealing and similar applications. *A. F. Holden Co.*

CIRCLE NO. 31, PAGE 7-8

Sand arrester tubes, nylon, fit in top of core box or blow plate for protection against abrasion. Strength and

CIRCLE NO. 149, PAGE 7-8

flexibility allows use in crooked, misaligned or oval holes. Said to resist stretch, shrink and attack by solvents. Have 1/16 in. wall, outside diameters 3/8 to 1 in. *Martin Engineering Co.*

CIRCLE NO. 32, PAGE 7-8

Drill press with electro-magnetic base has automatic power feed which can be disengaged. Depth of cut can be set. Said to increase production without operator fatigue. Drills up to 1-1/4 in. and taps 1 in. holes. *Portomag, Inc.*

CIRCLE NO. 33, PAGE 7-8

Resistance thermometer indicator and controllers permit scale spans as low as 50 F. Resistance bulb sensing unit may be 1000 ft from indicator, calibration need not be changed with lead-length. Standard and double scale ranges from -100 to 500 F have accuracy to 1/2 per cent of range. *West Instrument Corp.*

CIRCLE NO. 34, PAGE 7-8

Brush sanding drums from 37 to 74 in. wide for sanding or polishing wide metal sheets, consists of series of fibre brushes backing up abrasive strips that feed from inside drum, wiping abrasive against stock. *Merit Products, Inc.*

CIRCLE NO. 35, PAGE 7-8

pH meter has accuracy of 0.1 pH unit. Comes with either individual glass and calomel electrodes or "probe" electrode. Scale 2-1/2 in. long, 70 division lines from pH 0 to 14, continuous through neutral point without switching. *Photovolt Corp.*

CIRCLE NO. 36, PAGE 7-8

Mold coatings, spirit based, are applied by spraying, painting or swabbing giving protection against liquid metal and a superior finish. Used for green sand, dry sand and oil sand molds and cores. Grades are classified as to metal or alloy used, 11 available. *Foundry Service, Inc.*

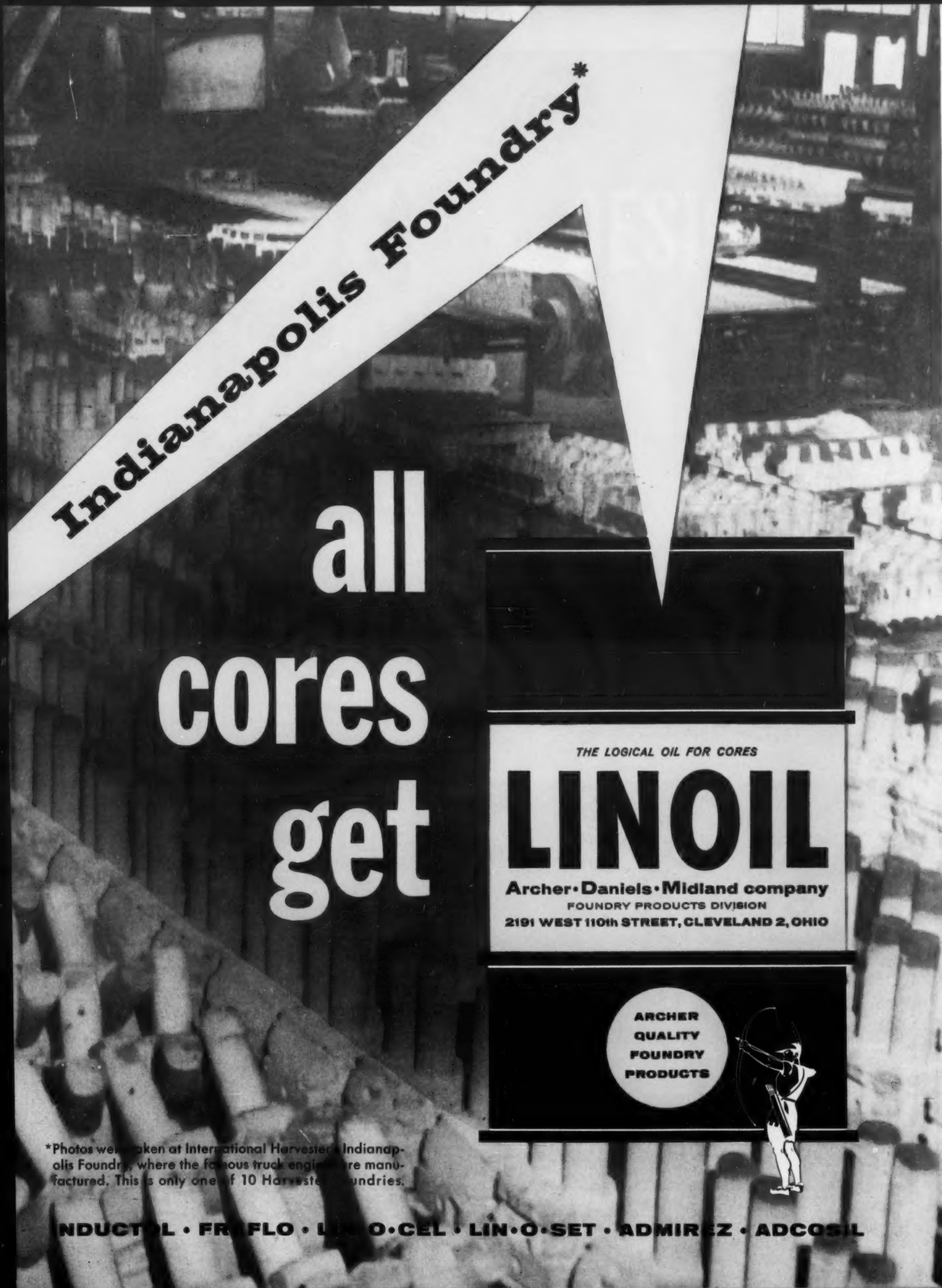
CIRCLE NO. 37, PAGE 7-8

Thermometer, stainless steel stem type, has minimum and maximum indicators so that total temperature variations are recorded. Accurate to 1 per cent over entire scale. Do not require pre-heating for hot materials. *Pacific Transducer Corp.*

CIRCLE NO. 38, PAGE 7-8

Adhesives, "Pliotac" a contact adhesive with good bond strength for large areas remains permanently flexible and is water and moisture re-

CIRCLE NO. 127, PAGE 7-8



sistant. "Pliobond H.T." is thermocuring adhesive for high temperature applications, cures at 350 F, does not creep under load at temperatures as high as 400 F. Retains flexibility throughout its service range. *Goodyear Tire & Rubber Co.*

CIRCLE NO. 39, PAGE 7-8

Non-indicating potentiometer-controller has easy to read scale, electronic control action and can be surface or flush mounted. Designed for use in control applications in batch process work such as non-ferrous melting furnaces. Comes in two models, one has off-on controller, other has anticipatory time-proportioning controller. *Wheelco Instrument Div., Barber-Colman Co.*

CIRCLE NO. 40, PAGE 7-8

Noiseless drilling machine with sawing bit cuts through re-inforced concrete at rate of one in. per minute in diameters to 6 in. Maintains a constant cutting speed, requires no external pressure. Weighs 150 lb. Diamond-faced bit is self-feeding. *J. F. Hamlin Co.*

CIRCLE NO. 41, PAGE 7-8

Resinoid bonded wheel internal lubricant "IL Bond" is said to increase abrasive cutting action. Added to wheel mix it combines fast cutting action of softer grades with long wear of hard wheels. Available in heavy duty snagging wheels. *Simonds Abrasive Co.*

CIRCLE NO. 42, PAGE 7-8

Microhardness tester for interior surfaces of chrome-plated metal castings is mechanically operated. Loads of 1 to 1000 grams may be applied to specimens at variable speeds. *Wilson Mechanical Instrument Div., American Chain & Cable Co., Inc.*

CIRCLE NO. 43, PAGE 7-8

Chain conveyor makes 180 deg turns on 5 in. radius for horizontal turns and vertical turns to 128 deg. Conveyor consists of link chain moving in steel tubes. Drive units available with single speed or 3:1 infinite variable speed adjustment. Hooks may be spaced on 6 in. centers. *Chain-O-Flex Corp.*

CIRCLE NO. 44, PAGE 7-8

Barrel finishing equipment cut deburring and polishing costs of stainless steel tubular parts 98 per cent for J. Bishop & Co., Malvern, Penn. Company formerly used hand scrapers, belt polishers and other hand tools.

◀ CIRCLE NO. 127, PAGE 7-8

Now deburrs and polishes 6000 small parts per hour at 0.000165 cents each. *Almco Div., Queen Stove Works, Inc.*
CIRCLE NO. 45, PAGE 7-8

Safety shoes have steel toe box, air cushion insole and pad that supports metatarsal arch and cushioned longitudinal arch support. Known as "Molders" shoe. *Bronson Shoe Co.*
CIRCLE NO. 46, PAGE 7-8

CO_2 injection kit for cores and molds consists of two-stage regulator, 15 ft of hose, hand-operated valve, couples, two sizes of interchangeable rubber plunger cups, steel injection tube and fittings. Suitable for hardening rammed or blown cores. *National Cylinder Gas Co.*
CIRCLE NO. 47, PAGE 7-8

Jackets, foundry, come in five basic types which are adjustable and self-aligning and fit more than one mold size. Made in any degree of taper. Jackets have extra holes so each side can be made one in. smaller. Individual sides can be replaced without scrapping whole jacket. Marked on each side length, cope and drag, type of flask and degree of taper. *Products Engineering Co.*
CIRCLE NO. 48, PAGE 7-8

Riser compound is said to keep gray iron and steel molten longer in risers, make possible smaller feeder openings and to give controlled insulation qualities. *M. A. Bell Co.*
CIRCLE NO. 49, PAGE 7-8

Vacuum furnace laboratory size, with interchangeable components is suitable for melting, annealing, brazing, sintering and degassing. Furnace has tilt pouring and rotary turntable. Vacuum connections are sealed with "O" rings. *High Vacuum Equipment Corp.*
CIRCLE NO. 50, PAGE 7-8

Air filtration system is said to be automatic. Continuous glass fibre curtain moves horizontally through air stream ahead of coils and fans with replacement needed once a year. Curtain is moved automatically by timer. *American Air Filter Co., Inc.*
CIRCLE NO. 51, PAGE 7-8

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 7-8. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

Three Chapters to Sponsor Eastern Regional in April

■ Application of atomic energy in foundries and new processes and techniques will be discussed at the East Coast Regional Foundry Conference to be held April 12-13 at the Benjamin Franklin Hotel, Philadelphia. The conference is sponsored by the Philadelphia, Metropolitan and Chesapeake chapters of the American Foundrymen's Society.

Walter Giele, Walter Giele Co., Lebanon, Pa., Philadelphia Chapter chairman, will preside as general conference chairman. Conference co-chairmen will be R. A. Colton, Federated Metals Div., American Smelting & Refining Co., Newark, N. J., Metropolitan Chapter chairman and L. H. Gross, American Radiator & Standard Sanitary Corp., Baltimore, Md., Chesapeake chapter chairman.

Friday, APRIL 12

8:30-9-30 . . Registration

9:30-9:45 . . Introduction, W. Giele, conference chairman presiding. Welcome by W. A. Morley, Link-Belt Co., Philadelphia, AFS National Director. Message from National Office by H. W. Dietert, AFS Vice-President.

9:45-11:15 . . Technical Sessions, Howard Voit, Sterling Wheelbarrow Co., Hackensack, N.J., vice-chairman Metropolitan Chapter, presiding. *"Plastics as Bonding Materials,"* O. J. Myers, Reichhold Chemicals, Inc., AFS National Director. *"Epoxy Resins as Pattern Materials."*

1:00-2-15 . . Luncheon, Don Roemer, Franklin-Balmar Corp., Baltimore, Md., vice-chairman Chesapeake Chapter, presiding. Harry Kessler, Sorbo-Mat Process Engineers, St. Louis, Mo., speaker.

2:30-4:30 . . Technical Sessions, Henry Winte, Florence Pipe Foundry and Machine Co., Florence, N. J., vice-chairman Philadelphia Chapter, presiding. Clyde Jenni, General Steel Castings Corp., Eddystone, Pa., technical chairman. *"Metallurgical Requirements for Atomic Applications,"* Dr. J. M. Simmons, Atomic Energy Commission. *Applications of Radioactive Materials in the Foundry,"* Dr. W. A. Pennington, University of Maryland.

7:00 . . Banquet, R. A. Colton, presiding. Dr. Kenneth McFarland, General Motors Corp., speaker.

Saturday, APRIL 13

9:00-12:15 . . Technical Sessions, Lewis H. Gross presiding. *"Carbon Dioxide Process,"* W. E. Gruver, Meehanite Metal Corp. *"Diaform Molding Equipment,"* Tom Barlow, Eastern Clay Products Dept., International Minerals & Chemicals Corp. *"Shell Mold and Core Making Equipment,"* Otto W. W. Winter, Beardsley & Piper Div., Pettibone Mulliken Corp. *"Vibrating Conveyors in the Foundry,"* J. M. Morris, Carrier Conveyor Corp.

let's get personal

C. H. Patterson . . is now in charge of the engine and foundry divisions of the Ford Motor Co. He was named group executive in charge of these divisions as part of a series of changes aimed at broadening the management organization of Ford's basic manufacturing divisions. He was formerly general manager, Engine and Foundry Division.

Five American Brake Shoe Co. foundries have been integrated into an Engineered Castings Division. **N. George Belury,** Brake Shoe v-p, has been named president of the new division. **Harry C. Platt** becomes vice-president in charge of operations and **Philip H. Clapp** becomes vice-president in charge of sales. Two district works managers have been named. **Raymond Martinson** will supervise the plants at Mahwah, Melrose Park and So. San Francisco. **Duncan Wilson** will oversee Rochester and Medina.

Harold F. Hanssen . . has been appointed plant manager of Howard Foundry Co.'s Electric Alloy Steel Division, Los Angeles. Hanssen had been serving in a similar position at Howard's Milwaukee investment casting foundry.

Maurice McQuiggan . . chairman of the Eastern Canada AFS Chapter has resigned from LaSalle Coke Co. Ltd.. and is now working in industrial sales for Canadian Bronze, Ltd., St. Thomas, Ont.

Herbert F. Scobie . . has been named executive secretary of Non-Ferrous Founders' Society. Formerly field manager, he succeeds **James W. Wolfe** who has retired. **Darlene D. McDermott** has been appointed assistant secretary-treasurer. Formerly editor of MODERN CASTINGS, Scobie started his foundry career about a year after graduation from the University of Minnesota in 1935 with a degree in chemistry.

Frank X. Bujold . . has been named general manager of the newly established foundry division of the Ford Motor Co. Bujold, a trustee of the Foundry Educational Foundation, started his foundry career with GM's Saginaw Malleable plant, moved to Campbell, Wyant and Cannon in 1944 as controller, and moved to Ford's Dearborn iron foundry in 1950. In 1952 he was named manager of Ford's foundries.

Frank Turk . . has been named quality control manager at Joy Mfg. Co.'s new Philadelphia, Ohio, plant. He was formerly foundry superintendent for the firm.

George F. Hodgson . . has been appointed assistant chief engineer of the Doehler-Jarvis division of National

H. F. Hanssen

J. W. Wolfe

H. F. Scobie

Lead Co. Hodgson joined Doehler-Jarvis in 1931 and his most recent post was plant engineer at the division's Batavia, N. Y., operation.

C. Westin

Superior Steel and Malleable Castings Co., Benton Harbor, Mich., has announced the promotion of chief metallurgist **Clinton Westin** to the position of assistant general manager. Replacing Westin as chief metallurgist is **Jay Rakstis,** chief chemist for the company since 1953.

J. Rakstis

Joseph N. Leaverton . . has been named superintendent of foundries for the Hamilton Foundry & Machine

J. N. Leaverton

Co. He was previously chief industrial engineer for the organization.

William Bryce . . has resigned from International Harvester Co. and is

now superintendent of J. A. Wotherspoon Soil Pipe Co., Ltd., Oakville, Ont. Bryce is immediate past chairman of the AFS Ontario Chapter.

Roy F. Nosek . . has been promoted to sales manager for Beardsley & Piper division of Pettibone Mulliken Corp. He has been associated with

R. F. Nosek

the firm for 20 years and has served as a sales engineer in Michigan, Ohio, Indiana and southern states for the past 12 years.

Jack C. Lucas . . has been elected president of Ross-Meehan Foundries, Chattanooga, Tenn. He succeeds Frank M. Robbins who has retired. Lucas joined Ross-Meehan as executive assistant to the president and was serving as executive vice-president at the time of his recent advancement.

Clifford E. Wenninger . . has been appointed technical director of the Beardsley & Piper Division of Pettibone Mulliken Corp. Wenninger will

C. F. Wenninger

work in sand reclamation development and research, as well as in sand conditioning and mulling problems.

Ernest F. Marquardsen . . has accepted an invitation to serve on the reactivated Steel Castings, Carbon and Low Alloy, Industry Advisory

Committee of the Business & Defense Services Administration. Marquardsen is vice-president of Pacific Steel Castings Co., Berkeley, Calif.

General Foundry & Mfg. Co., Flint, Mich., has announced two promotions following the retirement of former

O. E. Sundstedt

president **Carl W. Bonright. Oscar E. Sundstedt,** a veteran of 26 years with the firm, has been named president. **Samuel M. Bickley** has been named vice-president and assistant general manager.

Battelle Memorial Institute has re-elected **Dr. Zay Jeffries,** metals scientist and retired vice-president of General Electric, as chairman of the board of trustees. Battelle has also announced the appointment of **Dr. B. D. Thomas** as director of the institute. He becomes the third director of the organization, succeeding Dr. Clyde Williams who now serves as president.

S. M. Bickley

William E. Mahin . . former technical director of Vanadium Corp. of America and a management consultant, has been elected president of the Malleable Research & Development Foundation.

Donald H. Turner . . specialist in melting refractory metals has been appointed supervisor of melting and

heat treating services at Armour Research Foundation of Illinois Institute of Technology, Chicago.

Victor F. Stine . . has been elected to serve as president of Pangborn Corp., Hagerstown, Md. Stine is a veteran of 45 years with the company and has been a company vice-president since 1935. Further changes include the election of **Ralph M. Trent** as a director and as executive vice-president and **W. O. Vedder** as vice-president. **Thomas W. Pangborn** will continue to serve as chairman of the board, and **John C. Pangborn,** former 1st vice-president will serve as chairman of the board.

V. F. Stine

Robert J. McCarthy . . has been appointed as general manager of the Atlantic division of Mexico Refractories Co. He will retain his position as head of the wholesale firm, Missouri Refractories Co., Los Angeles, Calif.

Mrs. J. A. Warner

Mrs. J. Arthur Warner . . has been elected a director, vice-president and chairman of the finance committee of Detroit Gray Iron Foundry Co.

J. S. McCormick Co., foundry facing manufacturer, has elected **J. W. Earley**, president; **D. E. Cutler**, execu-

tive vice-president; **R. W. Bickerton,** secretary and treasurer. **W. N. Seese** has been named sales manager. **E. J. Bernarding** and **J. O'H. Denny** have been appointed representatives in Pittsburgh, **J. A. Arelt** will represent the firm in Philadelphia, and **J. H. Voight,** in Buffalo, N. Y.

Gordon M. Yocom . . assistant to the general manager, Wheeling Steel Corp., Steubenville, Ohio, recently completed a tour of Sweden, Germany, and England where he studied steel processing.

William D. Bailey, Jr. . . . has been named manager of Coquitlam Development Co., Ltd., Vancouver, B. C., subsidiary of Electric Steel Foundry Co., Portland, Ore. Bailey was formerly vice-president of Westlectric Castings, Inc., Los Angeles, and will be general manager of the foundry now being constructed in British Columbia. For additional information, see *foundry trade news.*

Roy O. Schiebel . . has been named 2nd vice-president of Magnaflux Corp., Chicago. He will be in charge of sales and marketing.

John L. Lamont . . has been named assistant manager of administration for the Metals Research Laboratories of the Electro Metallurgical Co., Niagara Falls, N. Y.

Wayne Belden . . has retired as president of Ajax Flexible Coupling Co., Inc., Westfield, N. Y. Belden helped to found the firm in 1920.

A. Howard Smith . . has been appointed manager of commercial research for Jeffrey Mfg. Co., Columbus, Ohio.

Four executive changes have been made at the Danville plant of Central Foundry Division of General Motors Corp. **Robert L. Newtson** has been named to the newly created position of production manager. **Thomas E. Smith, III,** has been appointed to another newly established job, that of general superintendent. **Arthur P. Siewert** has been named production control superintendent and **James R. Hayden** moves up to Siewert's former post as superintendent of the gray iron foundry.

Superior Foundry, Inc., Cleveland, has announced the appointment of

Warren W. Brown as manager of sales and marketing. **Norman Petitte** has been named assistant sales manager.

Two major organizational changes in the operating department of Aluminum Co. of America have been announced. **H. C. Erskine,** general manager of Alcoa's castings division, has been named assistant general production manager. **John L. Patterson,** general manager of the firm's fabricating division, will now extend his duties to include managership of the castings division works operations.

A. L. Pace . . has been named to the Radiation Protection Committee of AFS. He replaces Richard Holste as the representative from General Electric Co.

C. W. Gilchrist . . member of the AFS board of directors, has been promoted to assistant works manager, Cooper-Bessemer Corp., Mount Vernon, Ohio.

H. D. Bryk . . has been appointed manager of operations of Alloy Precision Castings Co.

William T. Gallagher . . has joined the technical service and sales department of Pennsylvania Foundry Supply & Sand Co., Philadelphia. His headquarters will be in Plainfield, N.J.

S. C. Lawson . . will represent Wellman Bronze & Aluminum Co. in Chicago and in Wisconsin and Minnesota. His headquarters are in Milwaukee.

Henry S. Panfil . . has joined the faculty of the foundry in the industrial engineering department at Pennsylvania State University.

Art Guidi . . has been named sales manager for Texas Foundries, Inc., Lufkin, Texas. Guidi was formerly superintendent of the firm's steel foundry. He replaces **J. R. Hewitt** who resigned for reasons of health.

Gordon C. Curry . . has been appointed to the newly created position of general sales manager of Precision Castings Co., a division of the Harsco Corp.

Hugh V. Allison . . president and general manager of the Allison Division, American Chain & Cable Co., Inc., has also been appointed as general manager of the firm's Campbell Machine Division, Bridgeport, Conn. The Allison division produces abra-

sive cutting wheels and the Campbell division produces abrasive cut-off machines.

General Electric Co.'s Foundry Department has named **E. S. Lawrence** manager of manufacturing engineering. He will have two assistants: **W. T. Herrick**, project engineer-structural, and **K. N. McIver**, project engineer-electrical.

Lithium Corp. of America has named four new vice-presidents and has elevated two to the new position of senior vice-president. New vice-presidents are R. B. Ellestad, W. M. Fenton, J. D. Herman, and J. D. Campbell. New title of senior v-p goes to W. W. Osborne and F. F. Clarke.

Arthur Herbener . . has joined Electro Metallurgical Co. as a sales representative. He has been assigned to the Pittsburgh office of the firm.

A. F. Sward . . has been named manager of the bonding materials department of Bakelite Company.

Walter E. Foreman . . has been appointed an abrasive engineer by Norton Company. His headquarters will be in Columbus, Ohio.

Alexander Beck . . general manager, Whitman Foundry, Inc., Whitman, Mass., has been elected vice-president of the AFS New England Chapter.

Oakite Products, Inc., has named **E. Lacy** and **John C. Ruttle** as technical service representatives in Houston and Detroit respectively.

E. D. Mooney . . has joined Benj. Harris & Co., Chicago Heights, Ill., as a foundry consultant.

William J. Goodwin . . has been appointed research engineer in the crucible laboratory of Electro Refractories & Abrasives Corp.

Martin A. Bertram . . is now manager of Thor Power Tool sales in the Great Lakes region.

Malleable Notch Ductility

Notch ductility tests of malleable irons as determined at the Naval Research Laboratory are available in 22 page report for 75 cents. *Notch Ductility of Malleable Irons* may be ordered from OTS, U. S. Department of Commerce, Washington 25.

pouring off the heat

Anglo-American confusion

■ In the December issue of MODERN CASTINGS appeared an article entitled "*A Complete Slag Analysis in 45 Minutes*" by W. T. Unfried. In the recommended procedure for determining magnesium oxide, not only the magnesium but also the manganese and calcium will be precipitated as phosphate. We tested the procedure using a standard slag containing 1.1 percent MgO and found an apparent magnesia content of 26.0 percent.

W. E. CLARKE
British Cast Iron Res. Assoc.

meanwhile back in Texas

Dear Mr. Clarke:

You are absolutely correct in your statements about the MgO determination. An important step was omitted in preparing this article. The MgO should be determined as a part of the CaO analysis. Instead of 20 ml of master solution start with 60 ml and increase the subsequent reagents proportionally. On very low MgO contents such as 1.1 percent, a double precipitation of calcium oxalate should be made. The filtrates from these precipitations are acidified with about 10 ml nitric acid and dried on the steam bath. The residue is brought into solution with about 5 ml hydrochloric acid and 20 ml water. It is then diluted to 150 ml and MgO determined as outlined in the article.

You are also correct about manganese being precipitated. Since we were making the tests on the final reducing slag the MnO contents were only about 1.0 percent and the MgO close to 10.0 percent. We sacrificed a little accuracy for speed. The alternate method for MgO described in the article should only be used with slags low in FeO because of interference from iron.

It is regretted that these points were not brought out in the paper. Thank you for your comments.

W. T. UNFRIED
Texas Electric Steel Casting Co.

acid slag analysis

■ The slag analysis techniques described in Mr. Unfried's article in December are applicable to acid-soluble basic slags. The main weakness seems to be the time required

to obtain a MgO result. I would like to call your attention to an article in the *Iron and Steel Journal*, Nov. 1955, describing a rapid method of slag analysis suitable, with slight modification, for both acid and basic slags. Any type of Spectrophotometer or Absorptionmeter may be used to estimate the MnO, FeO and TiO_2 contents.

V. Williams
Coneygre Foundry Ltd.

FOUNDRY FOOLS

A fool there was and he made a mold
He rammed it soft and he poured it cold
The casting wound up in the scrap heap, we're told
'Twas finned and burnt in, and couldn't be sold.
"There go the profits!" yelled the boss,
In voice and tone dogmatic.
"The foundry's full of chowderheads
With pigeons in the attic!"

A fool there was, and he set a core
In a mold down there on the dry sand floor
A perfect fit, but the blundering clown
Set it hindside afore and upside down.
Take comfort, fool, and try again
for everything that's in it.
You're not unique in the muttonhead strain
There's one born every minute.

A fool there was, and he made a prayer
To a rag, a bone and a hank of hair
And how was he viewed by his lady fair?
A bag, a groan and a tank of air!
(Would it be unsporting or overly bold
To state that the fool was forty years old?
And the saying goes, "Be wise with speed,
A fool at forty is a fool indeed.")

A fool there was, and he spent his dough
On a Cadillac with a radio
The lesson that he hadn't learned—
"Spend no more money than you've earned."
Would it be cruel to name this fool
This puzzlepated knave?
You'll see him in the mirror
Every morning when you shave!

▪ **From *The Foundry Bard*, a column of foundry poems appearing in *The ESCO Ladle* of the Electric Steel Foundry Co., Portland, Ore. Bill Walkins, former sand mill operator, is both the editor of the *Ladle* and the one, and original, Foundry Bard.**

British Report on Alloy And Its Mold Reactions

■ Alloy 220 is particularly prone to reaction with steam generated in green sand molds resulting in formation of an undesirable oxide layer on metal surface and absorption of hydrogen in the molten metal. Four conclusions relating to the extent of mold reaction in the 10 per cent magnesium alloy are contained in a research paper entitled "The Influence of Mould Variables and Inhibitors on Mould Reaction in Aluminum –10% Magnesium Alloy" by Marjorie Whitaker, Vol. 84, Journal of the Institute of Metals.

It was concluded that the extent of mold reaction in the 10 per cent magnesium alloy is influenced by mold variables such as ramming density, moisture content, and coarseness of the sand, by reason of the variation in the chilling power of the mold.

The soundest castings are obtained by using medium or fine sand and ramming as hard as is consistent with adequate permeability and other desirable characteristics. In 2 in. diameter castings, the porosity due to mold reaction was proportional to the square of the time of solidification. Ammonium bifluoride addition to the sand in amounts ranging from one to six per cent is more effective than boric acid in reducing mold reaction in this alloy, but it requires a well-ventilated foundry.

The following recommendations are made as a result of the research.

1. An addition of 0.004 per cent beryllium should be made to the metal.
2. Contamination of the melt with sodium should be avoided. Grain refiners are harmless.
3. Coarse sand should not be used and molds should be rammed as hard as is consistent with adequate permeability and other necessary characteristics of the mold.
4. Pouring temperatures should be as low as is consistent with good foundry practice.

A.W.S. Will Meet in April

Philadelphia will be host to the annual spring meeting of the American Welding Society, April 8-12. Ninety-four speakers have been selected. The American Institute of Electrical Engineers committee on electric welding will co-sponsor two sessions on resistance welding and one on arc welding. Among topics for discussion will be nuclear reactors and irradiation effects and the welding of titanium and zirconium.

the editor's field report

by Jack Schaum

The Trend Toward Aluminum: The automotive industry is the largest consumer of castings in this country. As such it has a profound influence on activity and trends in the casting industry. In the February issue of MODERN CASTINGS, M. F. Garwood, Chief Materials Engineer, Engineering Division, Chrysler Corp., outlined the use of castings in today's cars. Mr. Garwood stated, "We believe the trend to use more and more light metals in our future cars will continue." This year Chrysler has substituted aluminum die castings for 15 cast iron parts, three wrought steel, two pearlitic malleable, two ferritic malleable, and one permanent mold iron casting. The 1956 Chrysler Imperial contained over 80 lb of aluminum. This has increased to 129 lb for the 1957 model. Some 192 lb of aluminum is doing the work of 400 lb of cast iron and steel in the new Eldorado Cadillac. Reynolds Metals Co. has announced an increase of 300 to 500 per cent in the use of aluminum decorative trim in the '57 models. Many factors are contributing to this trend toward the use of more aluminum. Aluminum can be cast to very close dimensional tolerances, machines easily, and is readily adapted to low cost high production automation.

New Binder for Shell Molds: The sugar refining industry has been an active one in finding new uses for their waste residues. Fibrous waste products have been used for bedding and feeding farm animals and incorporated into building materials. Foundrymen will be particularly interested in learning that a sugar refiner has been able to extract an ingredient from the fibrous waste that has promise of being a good sand binder for shell molds. Indications are that it will be cheaper and coat sands faster than the currently used phenolic resin binders.

Super Precision Castings: Whenever the subject of precision castings comes up for discussion the Trenton Technical Laboratories, Inc., Trenton, Mich., are often referred to as the one producing the biggest, the smallest, and the most accurate precision castings in the country. In a recent communication from Arthur W. Gay, President of Trenton, he advises that they are producing castings weighing up to 1500 lb and measuring 60 in. across. These castings are accurate to ± 0.003 in. across the maximum dimension and have a surface finish of approximately 5 micro inches. This must be some kind of a world record!

Foundry Hobby Kits: We were slightly amazed to receive so many inquiries about the short item in the December issue of MODERN CASTINGS describing foundry hobby kits for sale. Evidently foundrymen just can't get enough of that stuff so they spend their weekends molding and melting too. If you haven't already written MODERN CASTINGS, inquiries should be made directly to the Kansas City Specialties Co., P. O. Box 6022, Marysville, Kan.

Centrifugal Casting of 2-in. Pipe: An Eastern foundry has recently installed machinery and equipment to accomplish the unusual—namely the centrifugal casting of 2-in. gray iron pipe. Although activities are still in the experimental stages, the company hopes to be able to announce commercial production in the not too distant future.

Mechanical Handling of Foundry Materials: Foundries throughout our country have become increasingly aware of the fact that expansion without mechanization is uneconomical. One of the biggest influences on the final cost of producing castings is the expense of moving the raw materials and the castings through the plant. Starting with the April issue, MODERN CASTINGS plans to bring to its readers a series of articles dealing with mechanical handling of materials in the foundry. The series will include such items as fork-lift trucks, front-end loaders, and the various types of conveyors utilizing belts, rollers, rails and pipes. Watch for the fork-lift truck story next month.

CIRCLE NO. 145, PAGE 7-8

committees in action

The Radiation Protection Committee met in Chicago, Nov. 19, with six present. An outline was prepared for the Foundrymen's Radiation Protection Manual and assignments for writing the various sections were made to members. Sections will be written on Hazards, Maximum Permissible Exposures, Selection and Training of Personnel, Instrumentation, Personnel Monitoring and Medical Controls, Shielding in General, Isotope Handling in Laboratory, General Procedures in Radiography, Use of Isotopes as Tracers in Melts etc., Use of Isotopes as Sealed Sources, and Emergency Procedures.

The Steel Division Research Committee met in Chicago, Nov. 20, with nine present. M. N. Pallotto presented a summary report of the work on "snotters" done during the past several months by Steel City Testing & Engineering Laboratories. The report is now being studied by all the members.

The Controlled Annealing Committee of the Malleable Division sent out in November a questionnaire to malleable iron producers to obtain information for a symposium of the heat treatment of malleable iron.

The Brass & Bronze Research Committee met in Ann Arbor, Nov. 29, with 11 present. R. A. Flinn, Prof. of Metallurgy, University of Michigan, reviewed the work being done at the University for AFS on pressure tightness of 85-5-5-5 alloy. Efforts are being made to establish a reproducible standard and a measure of the sensitivity of the existing pressure test equipment. Because of variations in the results of the reproducibility study a number of suggestions were made regarding foundry procedures to follow in subsequent experiments. The committee agreed unanimously to have the research continue. A report is planned for the coming Castings Congress.

The Industrial Engineering & Cost Committee met in Milwaukee, Dec. 10, with ten present. Four papers have been scheduled for the Castings Congress. W. E. Boswell was unanimously elected to serve as Chairman another year. Plans were initiated to arrange for a one-week course

in Industrial Engineering at the Marquette Management Center in September. A color film on "Value of Standard Data" is being prepared for showing at one of the sessions in Cincinnati.

The Air Pollution Control and **Steering Committees** are proud to announce that the AFS *Foundry Air Pollution Manual* has been printed and copies are available for purchase.

The Centrifugal Casting Committee of the Light Metals Division met in Chicago, Dec. 17, with eight present. It was decided to prepare a questionnaire on centrifugal casting and send it to a selected group of foundries using centrifugal casting methods. The list of foundries is being prepared by the members and N. Janco is designing the questionnaire to be mailed from AFS headquarters.

The Noise Control Committee is studying the revised editions of the following chapters of the Foundry Noise Manual: (1) Medical Supervision of Workers Exposed to Excessive Noise, (2) Physics of Noise, and (3) Physiological Aspects of Hearing and Hearing Loss.

The Light Metals Division Research Committee met in Warren, Mich., Jan. 8, with 14 present. This meeting was held to discuss the possibility of arranging with the Ordnance Tank-Automotive Command, Detroit Arsenal, for sponsorship of the AFS research project on the thermal dynamics of casting solidification. A contract proposal has been prepared between OTAC and Battelle Memorial Institute and is now being reviewed by Frankford Arsenal.

The Pearlitic Malleable Committee has prepared a "Report on Comparison of Properties of Liquid and Air Quenched Malleable Iron" for presentation at the 61st Castings Congress.

The Radiation Protection Committee is studying a chapter for the Radiation Protection Manual entitled "Introduction: External Hazards—Internal Hazards" prepared by W. Brobst.

MORE FACTS on all products, literature, and services shown in the advertisements and listed in Products & Processes and in For the Asking can be obtained by using the handy Reader Service cards, pages 7-8.

the SHAPe of things

safety, hygiene, air pollution

by Herbert J. Weber

How Wet Is Water?

When a small quantity of water is poured upon a level surface, the water does not spread out into a thin film but assumes a shape which is nearly spherical. The liquid surface acts like a stretched membrane and tends to become as small as possible. Since for a given volume a sphere has the smallest surface, the drop becomes spherical. This characteristic of liquids is called the surface tension which exerts a force that can be actually measured.

You have seen the trick of filling a glass with water to the brim and then carefully dropping pins in the glass until the water surface is quite bulged. This is due to the tendency of the surface to resist rupture.

Thus when one wets foundry floors or sand heaps with water, puddles form on top of the heap but the underlying sand is not wet at all. This is because the elastic skin of the water droplets resists penetration by the sand particles.

Now if the water is treated with a wetting agent, such as sodium lauryl sulfate, the surface tension is reduced and the sand grains will be wetted. Wet water poured on a pile of sand or on a sandy floor will penetrate immediately. Fine dust that will float on water will immediately sink in wet water. A duck will not sink in ordinary water because its feathers do not get wet but it will sink in wet water.

Wet water has several applications in the foundry. It can be:

1) Added to coolants to control dust from wet grinding operations.

2) Sprayed on molds before shakeout. Penetration is so good that much dust can be prevented.

3) Sprayed on sand windrows prior to blending with a sand cutter. Moisture is more uniformly distributed.

4) Sprayed on floors prior to sweeping without forming mud and yet allaying dust.

Wet water is not a substitute for a good dust collection system but may be used as an adjunct thereto.

Wetting agents containing a sodium ion such as in sodium lauryl sulphate will eventually affect the characteristics of the sand as the sodium ion builds up. These changes in characteristics will appear as different concentrations of sodium occur.

For example, because of the sodium there will be an increase in flowability; because less water is needed to temper sand when a wetting agent is used there will be a loss in dry strength; because of an ion exchange, Western bentonites may be converted to Southern bentonites resulting in a change of collapsibility which may be desirable for non-ferrous and undesirable for steel work. A sodium ion progressively added to a sand already containing sodium may result in an initially high green sand strength, but as the sodium builds up this will fall to an unsatisfactory value. Thus when wetting agents of this type are used, changes in sand characteristics must be watched for. These changes may be good in some cases and undesirable in others.

Wetting agents are commercially available in liquid, powder or cartridge form. They are shipped in concentrated form and require dilution in the approximate range of 1 part of concentrate to 1000 parts of water. Proportioning equipment is available to maintain constant concentrations.

Methods of application vary from the sprinkling can to the well designed spray system. It is important to select that type of spray nozzle and spray pressure which will create the correct size and pattern of spray droplets.

Wetting agents serve a purpose but they should not be regarded as cure-alls for dust problems.

In order to accomplish this some trial and error experimentation may be necessary. No matter how efficient the wetting agent may be, poor results will be obtained with an incorrect spray.

Provision should also be made for good maintenance of the spray system. Nozzles required to give good atomization must have fine orifices. Suitable filters should be placed in each bank and at the pump.

Industry, Education Will Discuss Problems in March

Panel groups will serve as a sounding board for discussions on the relation between industry and colleges at the 10th annual College-Industry Conference to be held March 13-14 at Cleveland. The conference is sponsored by the Foundry Educational Foundation.

Panel discussions will be held both days. March 13, G. K. Dreher, secretary, Steel Founders' Society of America will act as moderator for a discussion of *"Training Engineering Students in Cast Metals."* H. F. Taylor, Massachusetts Institute of Technology, will be the moderator for *"The Engineering Graduate Moves into the Foundry Industry."*

C. V. Nass, Beardsley & Piper Div., Pettibone Mulliken, Corp., former F.E.F. president will preside at the Wednesday meeting. J. H. Smith, Central Foundry Div., GMC, F.E.F. president will preside Thursday.

The program is as follows:

Wednesday, March 13

8:30 am . . REGISTRATION

9:00 am . . TRUSTEE, COMMITTEE MEETINGS

11:00 am . . WELCOME, J. H. Smith, F.E.F. president.

11:10 am . . *"Marketing Aspects of Engineering Education in Cast Metals,"* R. Meloy, marketing director, Gray Iron Founders' Society.

12:00 noon . . LUNCHEON, Speaker: Colin Carmichael, editor, *Machine Design.*

1:30 pm . . PANEL DISCUSSION, *"Training Engineering Students in Cast Metals." "The Development of Student Interest in Cast Metals,"* Warren C. Jeffery, University of Alabama. *"Teaching Cast Metals in an Engineering Curiccula,"* C. S. Crouse, University of Kentucky. *"Industrial Activities on the Campus,"* B. W. Niebel, Pennsylvania State University. *"The Development of Scientific Literature in Cast Metals,"* J. F. Wallace, Case Institute of Technology.

3:30 pm . . ANNUAL MEETING

Thursday, March 14

9:30 am . . PANEL DISCUSSION, *"The Engineering Graduate Moves into the Foundry Industry." "Recruiting Engineering Students,"* H. P. Skamser, Michigan State University. *"Training Young Engineers in the Foundry Industry,"* D. C. Ekey, Lebanon Steel Foundry, Lebanon, Pa. *"The Utilization of Engineers in the Foundry Industry,"* W. M. Dalton, Dalton Foundries, Warsaw, Ind. *"Growth and Development of Engineers in Industry,"* B. C. Yearley, National Malleable & Steel Castings Co., Cleveland.

12:00 Noon . . LUNCHEON

12:45 pm . . SUMMARY

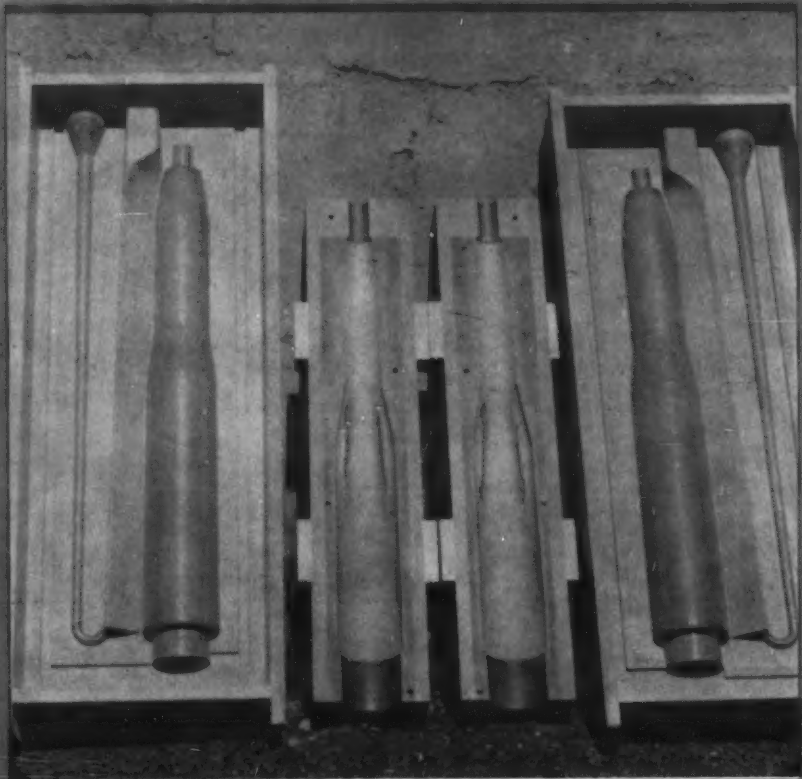


Fig. 1 . . Lehigh, without previous experience in non-ferrous metals produced 11,000 manganese bronze drill cartridges for first order.

Fig. 2 . . CO_2 gas arrives in core room at 300 psi and reduced to 75 psi. Small pressure drop has eliminated freezing of regulator valves.

WE OWE OUR SUCCESS TO CO_2

High strength of CO_2 cores permits Lehigh, Inc., to cast drill shells vertically using minimum of flask equipment

HANS JACOB / *Foundry Supt.*
Lehigh, Inc., Easton, Pa.

The Lehigh Foundry in Easton, Pa. has been known for many years in the foundry industry as a top ranking producer of Class A malleable iron castings. Recently this company has put into operation a new non-ferrous foundry. Their first order was for 11,000 manganese bronze drill cartridges. This step into the bronze casting business was a bold venture with a novel approach. Unfettered by previous experience it was decided that the best way to cast these 90 mm practice shells was in the vertical position. Realizing this could not be accomplished in conventional green sand molds, the idea of making the molds by the CO_2 process crystallized into a practical reality.

The unusual strength of the CO_2-hardened molds not only permits the cartridges to be cast in the vertical position but also eliminates the need for a lot of flask equipment. Only during ramming is the sand confined to a flask. A special clamping device holds the two mold halves together during pouring. Let's follow the sequence of operations in order of performance, starting in the core room.

The molding sand is prepared by mulling for one minute 400 lb of silica sand (75 AFS gfn) and 4 lb of sea coal, adding 4 lb of sugar syrup and mixing 2 minutes, and then pouring in 12 lb sodium silicate followed by an additional 3 minute mulling. Moisture is kept below 1/2 percent and care taken not to mull too long. The sea coal helps core collapsibility and the sugar develops a hard surface. This new mix is costing the foundry only \$0.005 per lb compared with \$0.009 per lb for the previous mix which had to be baked. The cost of CO_2 gas for hardening the cores runs about the same as the fuel formerly burned to bake the cores.

Since the sand muller is on the second floor it is a simple matter to gravity feed the sand to storage bins that open over the molder's

Fig. 3 . . Cores are rammed vertically in one piece. Gassing is done by inserting needle through center.

Fig. 4 . . Special flasks for added support are attached to molds before pouring. Trunions on side aid in handling.

Fig. 5 . . Bronze is poured at 1950 F, each mold takes 100 lb. of metal, filling is done in 18-20 sec.

bench. The wooden pattern plates and aluminum core boxes are shown in Fig. 1. Note the unusual gating system putting into practice several of the newer gating principles developed recently. This gating helped solve certain of the difficulties inherent to pouring good manganese bronze castings. Manganese bronze is prone to shrinkage defects and dross inclusions. These problems were minimized by bottom gating into a continuous wedge-shaped side gate topped with a riser. This design prevents turbulent metal from entering the mold cavity. Hot metal flows on top of the previous metal in the mold cavity so that the casting is continuously top poured. The riser is located on the top of this wedge gate. The wedge cross section acts as a choke to hold back dross from entering the mold cavity.

Returning to the making of the mold, about 136 lb of sand is rammed in a metal flask which is permanently attached to the pattern plate. Four reinforcing rods are bedded in the sand. Figure 2 shows the placing of a plywood board on the top of the rammed flask. The various hoses lead to six elbows attached to hollow gassing needles on the underneath side extending into the sand. From experience the number and location of the probes are determined in order to get a uniformly hard mold. The molder trips a switch that automatically opens a valve permitting CO_2 gas to flow through the needles and diffuse out through the sand mold. A timer cuts off the gas one minute later. During this time a quantity of CO_2 equal to 1 per cent the weight of the sand enters the mold. The gas comes from a large 6000 lb low pressure storage tank located outside the building. The gas is brought from the tank to the core room at 300 lb pressure and reduced to 75 lb for mold gassing. Because of this relatively small pressure reduction the problem of freezing regulator valves has been eliminated.

At the end of the one minute gassing the half-mold is completely hardened. It is rolled over and the combination pattern and flask are drawn off the mold.

The core for the drill cartridge is rammed vertically in one piece. CO_2 gassing is done by inserting a long hollow needle down through the center of the core and gradually drawing it out as the gas flows into the sand.

The hardened core, weighing 20 lb, is shown in position in one-half of the mold, Fig. 3. The molds are transported on bottom boards to the melting department. Molds have been stored here for several days before using and no appreciable deterioration evident. Just prior to pouring, the mold is clamped in a specially designed flask to support it during pouring. In Fig. 4 one mold is in a flask and is being transported by crane. Note the trunnions on the sides of flask to facilitate handling. The mold is placed on a roller conveyor and moved into position for pouring. The melting area is raised about 3 feet above the conveyor for the convenient pouring shown in Fig. 5. About 500-600 lb of manganese bronze ingot and return scrap are melted in the gas-fired furnace seen in the background. A monorail facilitates handling of the pouring ladle by one man. The bronze is poured at 1950 F, filling the mold with 100 lb of metal in 18 to 20 seconds. Sixty molds are poured per shift. After pouring, the mold is manually rolled to the end of the conveyor, flask removed, and casting shaken out.

The completed casting weighs 52 lb before it is machined, and all machining on the cartridge is done in the plant. After machining, the cartridges are assembled, packed, and shipped to the Army.

COST CUTTING WITH GRINDING WHEELS PART—2

WORK PRESSURE and WHEEL SELECTION

JOHN A. MUELLER /
The Carborundum Company
Niagara Falls, N. Y.

Work pressure has drastic effect on wheel life and cutting rates, particularly with softer wheels.

This is the second in a series of four articles in which Mr. Mueller describes means for reducing the cost of foundry grinding operations. The first two of these articles is devoted to snagging operations and the following two will cover cost reduction of cut-off operations.

The service life of a grinding wheel and the rate at which it cuts are both sensitive to changes in the pressure with which the work is held against the wheel. The effect of this pressure on cutting rate and wheel life becomes increasingly critical as the grade of the wheel becomes softer. Thus, correct work pressure and wheel grade selection are added to proper wheel speed as the control measures with which the foundryman can reduce snagging costs.

Pressure is extremely critical in the performance of the wheel, particularly with wheels that are in the soft grade range. Slight changes in applied work pressure substantially change wheel life. From a practical point of view, the pieces per wheel or the hours of wheel life will not be the same, wheel to wheel, if the size or shape of the work being ground changes or if the operator jams the work into the wheel. The same wheel cannot adjust itself to changing operating conditions and when conditions change, a different grade of wheel is required for maximum efficiency.

It follows that the other significant point is the selection of a wheel grade for the grinding operation. Wheels on the soft side tend to be sensitive to small changes in pressure which will affect their grinding performance. Wheels on the hard side will not be as sensitive to changes in operating conditions but may load and glaze and not cut as easily and freely as the softer wheels.

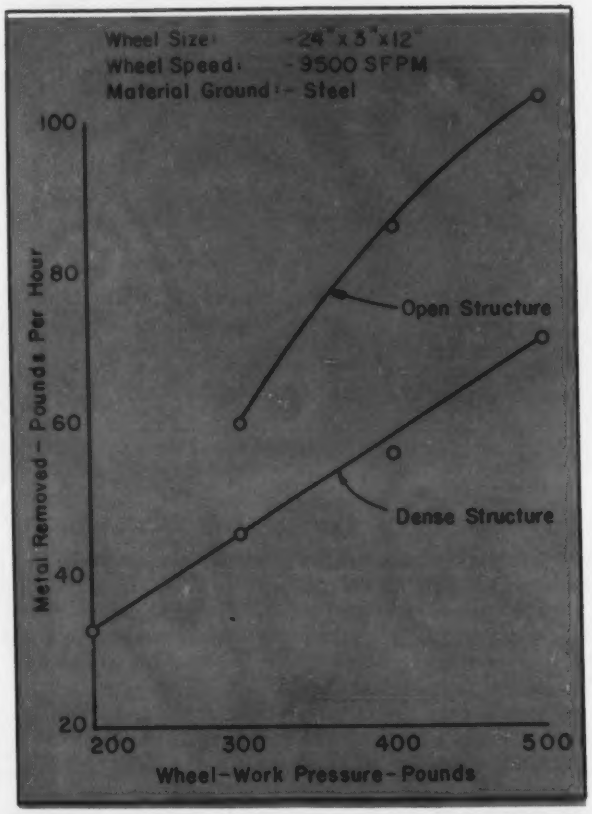


Fig. 1 . . Wheels must keep exposing sharp grains or they will load or glaze and stop cutting.

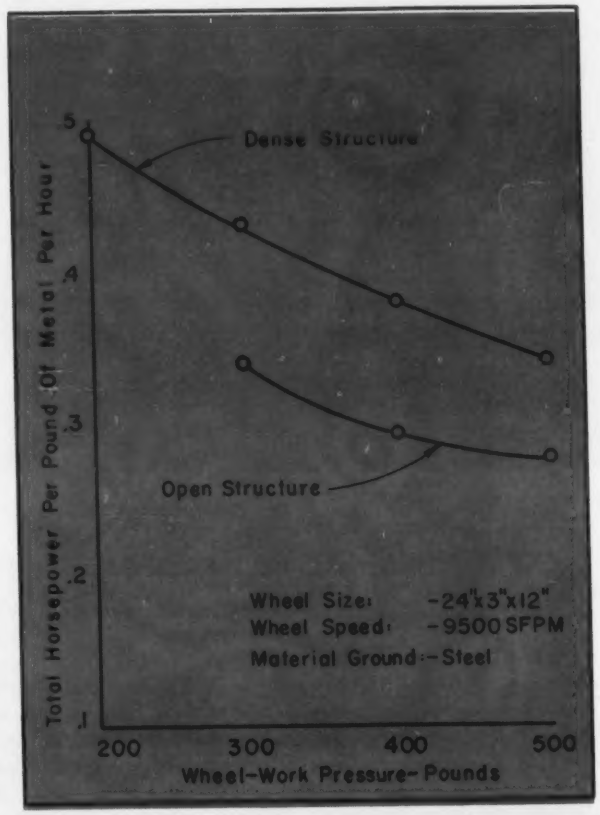


Fig. 2 . . Higher power consumption is required for removing metal with dense structure wheels.

Our test data clearly point out the difference in wheel gradings and show that dense structure wheels can withstand heavier pressures or in other terms lend themselves for usage on rugged operations. Conversely, open structure wheels are faster cutting than dense structure wheels at the same wheel-work pressure, and lend themselves to less rugged operations.

Abrasive wheels depend upon breakdown to remove metal. If wheels do not shed the dull grain and permit sharp grains to be exposed at the cutting faces the wheel glazes or loads and stops cutting. If the wheel breaks down too rapidly, the grain is thrown out of the wheel before it has had an opportunity to do any grinding. Obviously neither of these conditions would be satisfactory for a good operation.

A wheel is satisfactory when it continuously breaks down but at such a rate that the maximum amount of metal is removed by the minimum amount of wheel.

The choice of a suitable wheel is extremely important because it is a major influence in the cost of

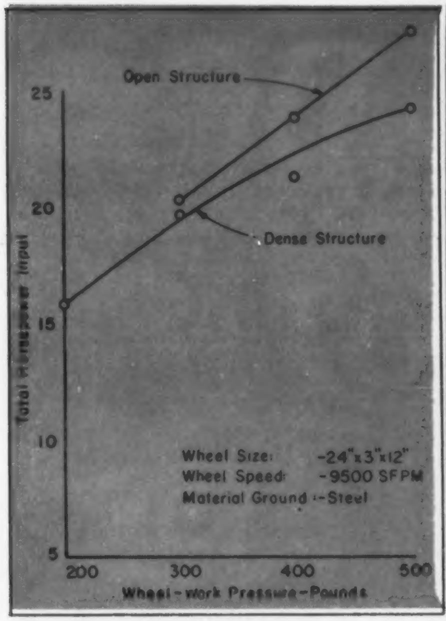


Fig. 3 . . Open wheels remove more metal at each pressure but use more power.

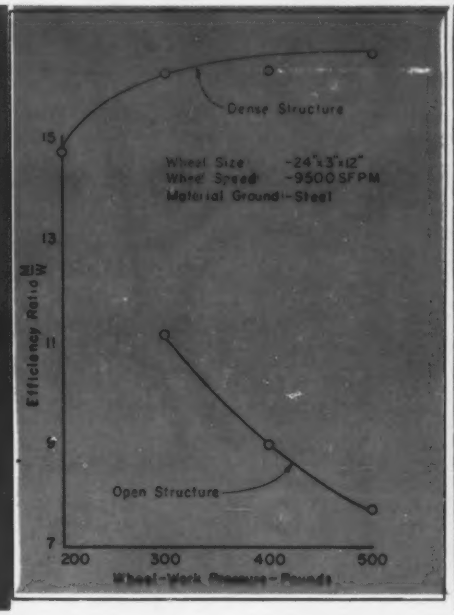


Fig. 4 . . Efficiency of softer wheels is cut rapidly as the pressure increases.

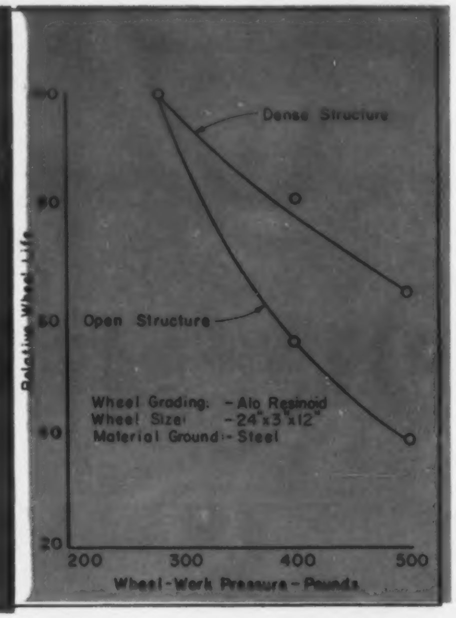


Fig. 5 . . Higher pressures show greater efficiency of dense wheels.

the grinding operation. To provide information on how different wheels perform under widely different grinding operations, two wheel gradings made with basically different formulations were tested to obtain the data presented in this article. One was the open structure wheel and the other was the closed structure wheel.

These wheels were operated on our automatic laboratory grinding equipment. These machines are hydraulically operated so that the effect of the individual operator's technique in applying the work to the wheel is entirely eliminated, although the machine is designed to duplicate the motions of the human operator. Precise control of the amount of pressure applied is possible with this equipment.

Figure 1 shows the manner in which the wheels ground as the operating conditions were changed from a relatively light grinding operation to extremely severe grinding operation. The closed structure wheel showed a definite increase in cutting rate as wheel-work pressure was increased. Up to the capacity of our machine, this progressive increase in cutting rate was definite and positive. For each 100 lb increase in wheel-work pressure, the rate increased 40 per cent.

Our tests were not able to find the wheel-work pressure where the dense structure wheel broke down at an uneconomical rate. The open structure wheels as Fig. 1 shows, removed metal at a faster rate than the closed structure wheels. However, as the wheel-work pressure was increased the cutting rate showed signs of approaching a maximum. An increase in wheel-work pressure from 300 to 400 lb produced a 43 per cent increase in cutting rate. When the pressure was increased to 500 lb the cutting rate increased only 28 per cent.

This indicates that further increase in the wheel-work pressure would result in progressively smaller increases in cutting rate and would probably ultimately result in lower cutting rates.

Figure 2 shows the energy required to remove a pound of metal per hour. Here it is obvious that the dense structure wheels required more energy to remove a pound of metal per hour than the open structure wheels.

Figure 3 shows the power consumed by open and closed structure wheels. The open structure wheels consumed more power because they removed more metal at each pressure than the dense structure wheels. The more work that is done obviously requires the greater power input.

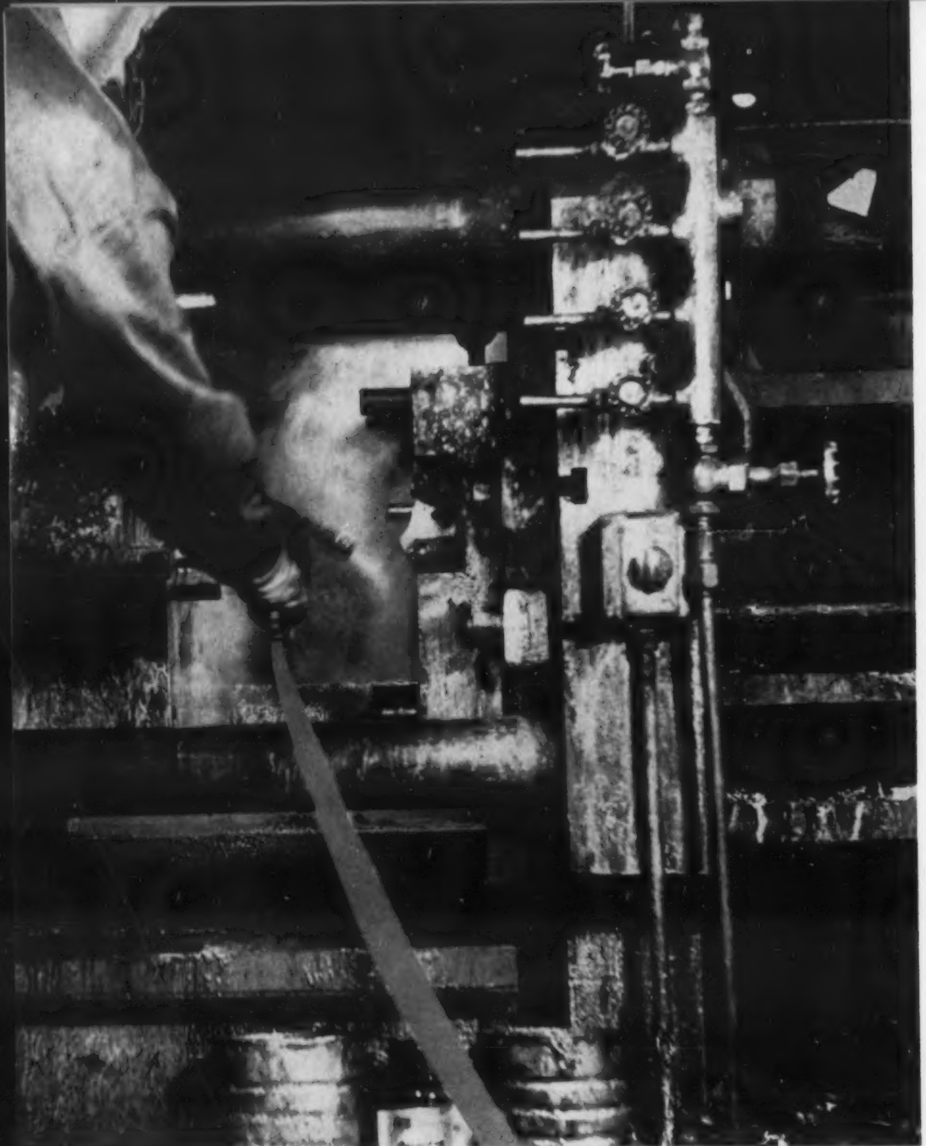
Figure 4 shows the change in wheel life as the wheel-work pressure was increased. The dense structure wheels lost 30 per cent life for an increase of 40 per cent in cutting rate. The open structure wheels lost 80 per cent of their life when the pressure was increased from 300 to 400 lb and the cutting rate increased 46 per cent. The open structure wheels used 16 per cent more wheel for each 20 lb increase in pressure.

Figure 5 shows wheel efficiency at the various pressures. As wheel efficiency is the ratio of metal removed per unit of wheel loss, it is a measure of how effectively the wheel removes metal and how much metal it will remove during the life of the wheel. It is obvious from the graph that the dense structure wheels are substantially more efficient than the open structure wheels at all wheel-work pressures and particularly at the heavier wheel-work pressures. It is evident from Fig. 5 that the efficiency of the open structure wheels decreased 15 to 20 per cent for each 100 lb increase in wheel-work pressure. At 500 lb wheel-work pressure, the efficiency was so low that, the operation would not be considered feasible.

On the other hand, the dense structure wheels produced higher efficiencies with an increase in wheel-work pressure and the differential in wheel performance between the two types of wheels became greater at the heavier pressures. Manifestly, the dense structure wheels made more efficient use of the abrasive available.

If the two types of wheels are compared with each other when they remove metal at the same rate, the dense structure wheels are 50 per cent more efficient than the open structure wheels and have 60 to 70 per cent more life. Figure 1 showed that equivalent cutting rates were produced when the dense structure wheels were used at 400 lb wheel-work pressure and when the open structure wheels were run at 300 lb wheel-work pressure. This also shows that it required approximately 30 per cent more pressure to be applied to the dense structure wheels to produce cutting rates equivalent to the open structure wheels.

Obviously, if the cutting rate produced by the dense structure wheels satisfies production standards it will be substantially more economical to use them in place of open structure wheels.



Three second spraying has cut Bendix rejection rate by 30 per cent.
ACHESON COLLOIDS CO.

Graphite Spray

SPEEDS DIE CASTING

Reduces surface and internal defects while increasing die life

The use of colloidal graphite die lubricants has slashed the rejection rate for die castings by 30 per cent at Bendix Foundries, Teterboro, N. J.

Using the lubricants in their cold chamber machines, this plant has found that surface folds, internal gas-induced porosity and other causes for the high number of rejects on turbine blades and aluminum main frame castings for air speed indicators have been greatly reduced by using the lubricants.

Other advantages were found to be a finer finish than obtained with parting compounds such as oil and grease, the elimination of fumes present with some oil-based mixtures, and easier preparation.

This water-base dispersion of colloidal graphite, prevents the molten metal from soldering to the steel die, inhibits its tendency to combine with the iron in the die surface, and lubricates the faces of the die cavity to insure proper metal flow. The slick, adherent lubricating film on the die face also increases the life of the dies. The film resists the scrubbing effect accompanying injection of the molten metal often as high as 30,000 psi.

Since the melting point of the aluminum and magnesium alloys ranges from 1250 to 1300 F, it is necessary to use dies of alloy steel which have been heat-treated to a hardness of approximately 48 Rc so that the dies can withstand the die-casting pressures and resist heat-checking.

The operator sprays the mixture over the entire die surfaces and recessed areas when the machine is in an open position. The die must be warm, at least 250 F, to insure proper adhesion of the colloidal graphite. In continuous operation, the heat from the molten metal keeps the die at adequate heat. In a start-up, supplementary heat is applied to the die by means of gas heaters.

The entire spraying operation takes only two or three seconds. Once the lubricant is applied, the water completely evaporates before the die is closed, leaving a film of pure graphite.

Colloidal graphite will not volatize when in contact with the hot metal poured at about 1250 F. There are no gummy or carbon deposits on the dies to mar the finish of the casting, no build-ups in recessed corners, and no gaseous effects to weaken it structurally.

Graphite, being inert, will not attack or corrode the die steel. Any discoloration of casting surfaces which might occur due to graphite is not objectionable, since Bendix fine-grit blasts all castings before painting in order to get good paint adhesion.

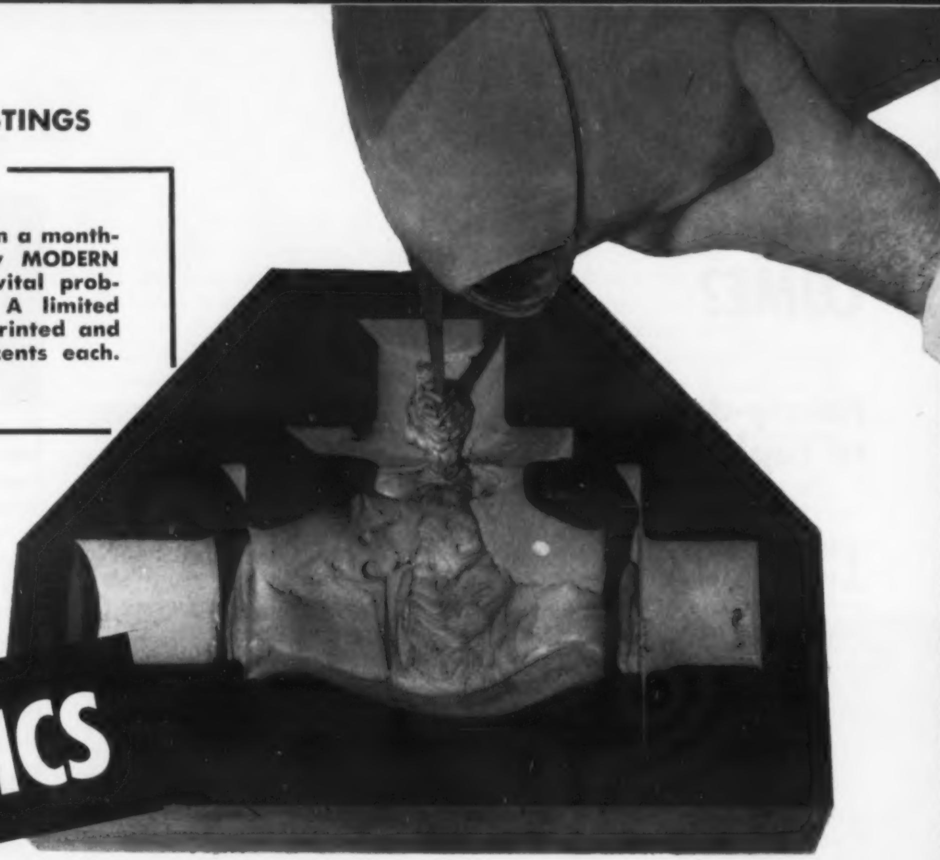
As the film of graphite is not destroyed each time a shot is made, the frequency of spraying is reduced. In many cases, one application in ten or more cycles is adequate.

Graphite does not volatize when contacting metal at 1250 F. No gummy deposit or carbon remains on dies to mar surface finish.

A MODERN CASTINGS

BONUS

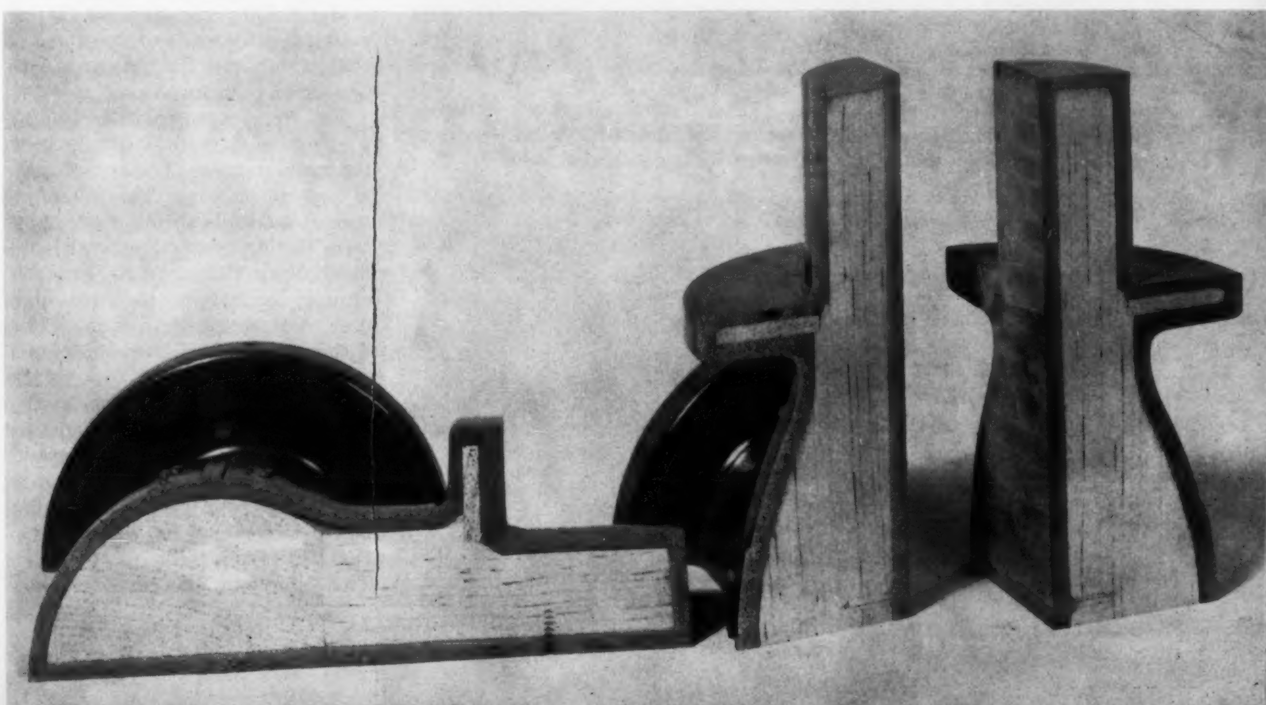
This report is the 20th in a monthly series presented by MODERN CASTINGS to analyze vital problems in the industry. A limited number have been reprinted and are available for 50 cents each.



PLASTICS

REVOLUTION IN PATTERNMAKING

Patternmakers now build "plastic tooling" as resins bring changes in patternmaking practices



HOW FAR HAVE PLASTIC PATTERNS COME?

E. J. McAfee /
Master Patternmaker

Newly-developed epoxy resins threaten to replace metal patterns

K. A. Clinton /
Supervisor, Tool Engineering
Puget Sound Naval Shipyard
Bremerton, Washington

Within the next few years plastics will revolutionize present patternmaking practices, primarily in the field of metal patterns.

The development of epoxy resins in the past five years has renewed the interest in plastic pattern equipment that began at the end of World War II. Epoxy resins are being investigated and applied at such a rapid and expanding rate that it is now possible to present in this Bonus Section a discussion of plastic pattern application, fabrication, materials, and necessary facilities in such detail and scope that this information can be used as a guide by pattern shops to start the manufacture of plastic patterns and core boxes.

Epoxy resins have overcome the unsatisfactory reputation first earned by plastic pattern equipment when phenolic resins only were used. Due to the high shrinkage, instability after initial curing, reactivity, and the oven curing equipment needed, the results obtained in the use of phenolics were unsatisfactory.

The newer epoxy resins avoid many of the objectionable characteristics of the phenolic resins, and it is these epoxies that will revolutionize present patternmaking practices. However, the initial cost of a plastic pattern remains higher than that of a wooden pattern. Plastics, therefore, cannot economically compete with or replace wooden hand molding patterns.

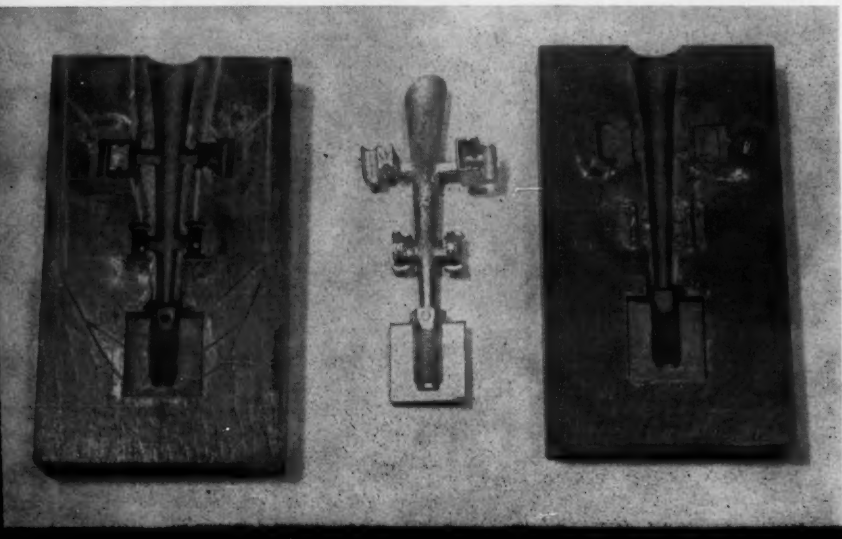
The area of pattern application to which plastics generally apply is in the machine molding pattern field where materials other than wood are used. One exception to this is in the manufacture of identical components for a pattern. Where several identical components are required, a master model or pattern of the component can be made and the required number of plastic duplicates molded. Economy of this practice is dependent upon the number, shape, and complexity of the component required.

Another exception is the replacement of worn-out existing patterns. If an existing pattern needs replacement, the worn pattern can be used for making a mold, and a plastic pattern formed at low cost.

The effective productive life of a wooden hand or machine molding pattern is estimated to be 500 molding operations. For quantities in excess of this, metal patterns made of aluminum, brass, or cast iron are normally used. It is for these quantity molding applications that the plastics can be used to best advantage. The productive life of plastic patterns has not been accurately established. However it is known that their productive life is significantly greater than that of wooden patterns and approaches that which can be obtained with aluminum patterns.

For this reason, plastics can be used to advantage as a substitute for metal patterns. The cost of metal patterns is high. The manufacture of a double shrink master pattern, casting, machining, and hand finishing of the metal to close tolerances contribute to their high cost. A master pattern is made for the preparation of the mold for a plastic pattern. Only one shrink allowance is required since the plastic duplicates the dimensions of the mold in which it is laid up, or cast. The plastic pattern obtained from the mold is in a finished state except for trimming excess material at the parting line. This eliminates the costly machin-

Casting in plastic. Low melt alloy castings can be poured in plastic molds. High temperature epoxies are a new development.

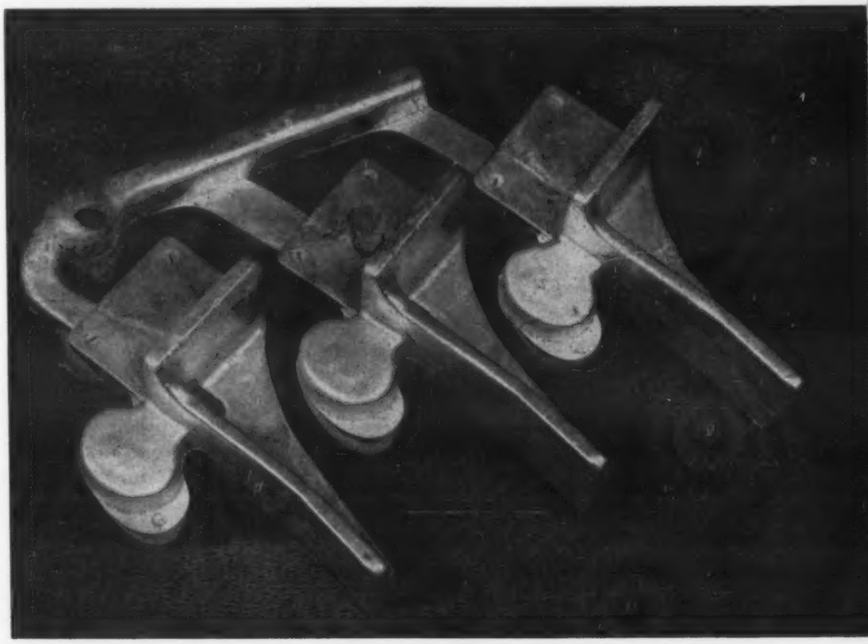


ing and hand finishing operations required on metal patterns.

One, or a number of plastic patterns, can be fabricated in the same mold. This makes possible the fabrication of duplicate or multiple sets of plastic patterns with a cumulative productive life equal to that of any pattern material. Cumulative cost is less than that required to fabricate a single metal pattern. The same principles and advantages apply to the manufacture of core boxes with plastic materials.

In addition to their use as a pattern material, plastics can be applied as a coating on wooden patterns. Parting of patterns from synthetic sand can be difficult if a suitable pattern coating is not used. Excellent parting characteristics are obtained with phenolic pattern coating. This plastic coating also increases the productive life of the pattern by providing improved durability and greater resistance to abrasion. Work is presently being conducted on epoxy coatings which do not require an oven cure, this cure being necessary with the phenolic coatings.

Plastic molds for shell molding may also appear as a future application now that high temperature epoxy resins have been introduced. These resins will withstand temperatures to 400 F. A further discussion of these resins is included in another part of this Bonus Section.



High temperature resins to use as molds for metal pattern components are the latest items added to materials list for plastic equipment.

WHAT GOES INTO A PLASTIC PATTERN?

New methods have their own complications and require more than just a few cans full of resin

It takes more than just some resin poured out of a can to produce a plastic pattern. At this time, there are two successful methods for making plastic patterns. One requires that the plastic be cast around an inert core, and the other involves the lay up of a plastic laminated shell with the core filled with back-up material. Consequently, it is necessary to supplement the plastic with other materials which have a vital importance in producing the final product.

■ **Resins**

The resin, of course, is of first importance. As has been noted, phenolic resins are used as a coating material, and were used for a time as a pattern material. Based on the results obtained in the use of the epoxy resins, their exclusive use for pattern purposes is now recommended.

The epoxies have characteristics which make them most applicable for this purpose. Principal advantages to be obtained are as follows:

Versatility—Available both in laminating and casting type resins. Casting resins can be filled with a variety of materials.

High Dimensional Stability—Patterns are dimensionally stable under varied conditions.

High Strength—Physical properties are equal or superior to the other resin types.

Low Shrinkage—Lowest shrinkage in curing and storage of any of the resin types permits the highest degree of dimensional accuracy.

Excellent Adhesion—Insures good bonds between resin and inserts,

reinforcements, filler materials, and cured plastics for repair.

Good Wetability—Aids complete and consistent impregnation of glass cloth reinforcing with resin for maximum strength.

Room Temperature Cure—Most resin types are cured at room temperature, eliminating the need for curing ovens and equipment.

Nonreactive With Other Materials—Metallic, wood, foam, and various fillers and inserts may be cast in place or attached without protective treatment.

Epoxy resins are supplied in two component parts; the resin and the hardener. Both of these components are in liquid form. The addition of the hardener to the resin in specific designated proportions results in an exothermic chemical reaction which cures the resin to the hardened state in a relatively short time. Resins are available in the following basic types:

- **Casting type.** Resin usually filled with mineral or metal powdered fillers. Fillers are used to reduce the amount of resin in a given volume thereby reducing the heat of cure, shrinkage, and cost. The casting resins are filled to varied extent. Highly filled resins are available for large cast sections. Other casting resins with varied amounts of filler are available, each with limited possible casting volumes and thickness.
- **Laminating type.** A comparatively low viscosity resin either clear in color or colored. Usually unfilled or filled only to a very limited extent to facilitate the wetting of the glass cloth and the elimination of bubbles and air pockets in the laminate.
- **Surface coat or die facing type.** A filled resin with thickening agents added to give a putty-like consistency. This resin is used as a gel or surface coat. Available in both hard and tough types.
- **Splining type.** Similar to surface coat type resins. Thick, putty-like material used for splining purposes in reinforcing joints in the pattern.
- **High temperature type.** The high temperature casting resins are a recent development in the epoxy resin field. They are intended for high temperature application to 400 F and can be used as molds for low melt alloys. Available in both laminating and casting types, the resins require oven curing. Use of the resin as a mold material for low melt alloys has been found to produce excellent results with no distortion or damage with pouring temperatures to 400 F.

All of the various type resins are basically the same. The addition of fillers and other materials makes the basic material suitable for different applications. The type and quantity of hardener used affects the curing time, shrinkage, and physical properties. Hardeners and resin combinations are available in low, medium, and high exotherm types. The term exotherm is used to indicate that the plastic gives off heat during curing as a result of a reaction between the resin and the hardener. Generally, high exotherm types are used for laminating, and low exotherm types for casting.

The strength of epoxy resins is comparatively high. The tensile strength of laminates is approximately one-half that of mild steel.

Supplementary Materials.

- **Glass cloth and fibers.** Glass cloth, mat, roving and fibers are commonly used as a reinforcing material with the epoxy resins. In most cases glass cloth approximately 0.015 to 0.020 in. thick with approximately twelve to fifteen threads per inch of a plain weave type is used. Glass woven roving is used in those instances where a thick laminated section is encountered. The roving is approximately 1/8-in. thick, and when laminated, is the equivalent of approximately eight layers of cloth. Care should be taken in the use of roving to insure that complete and thorough resin impregnation is accomplished. Glass mat is used for the same purpose as roving; however this material is not recommended as it is very difficult to handle and properly impregnate with resin. Chopped fibers are used as a filler with tooling resin to obtain a paste or putty to fill sharp radii, or as a filler to reinforce cast sections. It is very important that the glass cloth, roving, and fibers used be treated so that wetting of the glass with the resin and the bonding of the resin to the glass is assured. Garan, Volan, and Silane treatments are considered satisfactory.
- **Parting agents.** Parting agents are required for the parting of the plaster mold from the master pattern in the fabrication of the mold, and the parting of the plastics from the plaster mold. For the parting of the master pattern from the mold, glycerin is used. Paste wax, commercial water soluble solutions of polyvinyl alcohol, and local chloride-vinyl acetate parting agents are used for parting of the plastics from the mold. A good paste floor wax, containing carnauba wax, is recommended.
- **Flexibilizer.** Flexibilizer can be added to the epoxy resins to obtain a resilient or rubber consistency. The flexibilizer used is a thiokol monomer. Generally its use is considered superfluous.
- **Solvents.** Solvent is required for general clean up and removal of plastic from clothing, tools, and work area. Both acetone and ethyl methyl ketone are used.
- **Silica thickening material.** It is possible to increase the viscosity of the resin by adding a thickening material, a light, fluffy highly absorbent silica material. In pattern work the material has been used to modify resins which were intended for casting purposes to a thickness that makes their use as a surface coat resin possible.
- **Plaster.** Gypsum plaster is used for mold fabrication.
- **Thickness allowance material.** In some cases, plastic pattern cores are prepared prior to the application of an outer plastic pattern surface. When the pattern is fabricated in this manner, a thickness of material as an allowance for the surface material is placed in the mold during core fabrication. Sheet wax is sometimes used for this purpose, although a type of putty approximately 1/4-in. in thickness in sheet form is most commonly used.

PRODUCTION METHODS—BASIC TECHNIQUES

Fundamental fabrication techniques apply to all methods of plastic patternmaking

Plastic pattern equipment is manufactured by two basic methods: laminating and casting. Laminated plastics have the best possible physical characteristics resulting in the strongest and most durable structure. However, the lamination of glass cloth and resin is a time consuming operation. The casting of plastics is simple and requires little time. However, casting in volume results in excessive shrinkage. The method or combination of methods used is controlled by determining which will provide acceptable results during manufacture, and by the application of the plastic equipment produced.

In plastic pattern and core box fabrication, strength of the plastics in either the cast or laminated form has been no problem. Casting resins provide physical characteristics capable of withstanding foundry service. Stability of the resin during cure has been the primary controlling consideration in the manufacture of patterns and core boxes.

As has been noted, experiments with solid cast patterns were unsuccessful due to excessive and inconsistent shrinkage. As a result, modified methods of manufacture were developed to insure dimensional stability. It has been found that methods of manufacture which limit resin thickness and volume assure acceptable results. The only exception to this is in very small patterns, and patterns having consistent thicknesses not exceeding 3/8-in.

The surface coat and splining resins, which are putty-like in consistency, might be considered an exception to the two basic methods of application. The consistency of these resins makes it possible to brush resin thicknesses of approximately 1/16-in. on the molds without settling or sagging of the resin. However, the application of these materials is either a limited casting operation or a modified laminating operation if glass cloth reinforcing is used.

Whether the pattern equipment is to be constructed by laminating or by casting there are procedures which are generally applicable to all methods of fabrication and these should be studied before examining the more detailed procedures required to produce a pattern by a specific method.

▪ Molds and mold preparation

Molds. A mold is used for the fabrication of plastic patterns and core boxes. Molds used for patterns are plaster, faced with low fusing alloy. The same type of mold can be used for plastic core boxes. However, because core boxes are of a female shape, wooden molds can be used to best advantage. For both types of molds, wooden master models are prepared for the fabrication of the mold. The wood used is usually pine. The master model is coated with lacquer prior to use in making the mold. From this point the mold for a plastic pattern or core box is prepared.

Wooden mold preparation. As has been noted, wooden molds are used in most cases for the fabrication of core boxes. The mold consists of wooden models of the core shape mounted on a flat surface with a vertical box or frame mounted on the surface to form the outer shape of the core box. Material used for frame and surface is wood, pine being used in most cases. Preparation of the assembled mold prior to the application of plastic is as follows:

1. Apply paste wax to the mold surfaces and buff by rubbing with cloth.

2. Spray or brush two coats of parting agent on the mold. Spraying of parting agent is recommended. Commercial polyvinyl alcohol parting agents are used for this purpose.

3. After the parting agent has dried, apply another coat of paste wax and lightly rub off excess wax. The mold is now ready for the application of the plastic materials.

Molds for plastic patterns are faced with a sprayed-on alloy.

Metal faced plaster mold fabrication. Plaster molds can be used for the manufacture of plastic patterns. However metal faced plaster molds are preferred. Metal facing

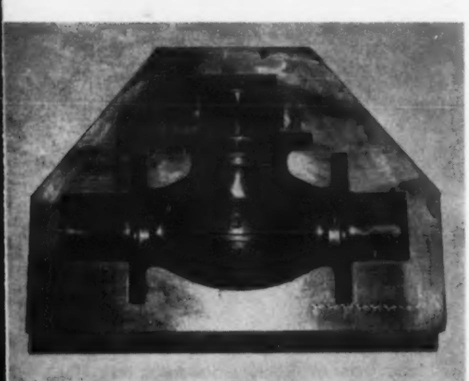
Plaster for mold is poured into metal-sprayed mold container.

eliminates the need of completely dehydrating the plaster prior to use, and insures the easy removal of the plastic pattern without mold damage. The metal also provides an excellent mold surface. Because of the superior drawing characteristics of the metal facing, the mold can be used for numerous patterns. Procedures used in the manufacture of metal faced plaster molds are as follows:

1. Mount the master pattern on the parting surface with vertical frame surrounding the pattern to form the exterior mold shape. Wooden surface and frame construction are used.

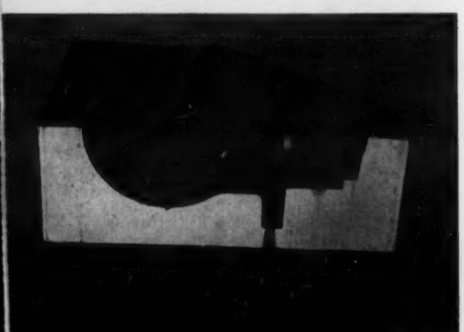
2. Rub a thin coating of glycerine on the master pattern, and interior surfaces of the mold frame.

3. Spray low fusing eutectic alloy on the pattern and mold frame to a thickness of 1/64 to 1/32-in. Alloy preferred for this purpose is low melt eutectic alloy with a melting point of approximately 200 F.



Finished metal-faced mold after removal from the mold container.

Cross-section shows excellent surface of metal-faced mold.



4. Mix and pour plaster to the height of the mold frame. Note that wire can be put in the plaster for reinforcing. The pouring of plaster into the mold frame is illustrated.

5. After the plaster has set, invert the mold frame, withdraw the master pattern from the mold, and remove side framework.

6. Polish mold surface with steel wool or a fine grade of crocus cloth. If metal spraying equipment is not available, molds faced with plastics can be employed with results comparable to those of the metal faced molds. This method is expensive and possibly unsatisfactory as it is completely plastic. The use of plastic as a thin facing backed up with plaster or an economical and stable backing material could be employed to better advantage.

Metal faced plaster mold preparation. Preparation of the metal faced mold for the application of plastic is as follows:

1. Brush or spray parting agent in accordance with the following formula on the metal faced mold: Hand shave a piece of chloride vinyl acetate sheet. Dissolve these shavings in methyl ethyl ketone, using enough solvent to obtain a light syrup consistency. Add dye or coloring so that application is visible.

2. After drying of the parting agent, apply paste wax and lightly polish.

3. Apply a commercial water soluble polyvinyl alcohol parting agent on the wax. After drying of this parting agent the mold is ready for the application of plastic. Spraying of parting agents is recommended as it provides a better surface. It is noted that this procedure is that which has been found to give best results with the metal faced molds. If plaster molds are used it is mandatory that they be sealed prior to the application of wax and parting agent.

▪ Preparation of glass cloth

Glass cloth is used in the "face and fill" method of pattern construction to be described later. Small glass patches are used in this case, which should be cut prior to the mixing and application of resin. In general it is good practice to cut and tailor glass cloth for proper fit and lay on the mold before resin mixing and application in any type of laminating operation.

▪ Mixing of resin and hardener

Resin and hardener are mixed in specific proportions as recommended by the manufacturer. These proportions are usually specified on a weight basis. It is important that the approximate volume of resin required be determined prior to the mixing so that an excess is not mixed. It is good practice to mix the resin in small quantities to eliminate waste, and insure the use of the resin prior to its gelling. After determining the quantity that is required, the resin and hardener are weighed in the proportions recommended and mixed. Filled resins should be stirred in the drum or container prior to being weighed and mixed as the fillers sometimes settle. Mixing and weighing is most effectively accomplished in disposable paper cups and containers. In mixing, care should be taken to stir slowly and carefully to prevent the forming of air bubbles.

▪ Application of surface coat resins

Surface coats of facing resins are applied to plastic patterns and core boxes to advantage. These resins are thixotropic or putty-like in consistency and can be applied without sagging. They also provide a smooth bubble-free surface. The surface resins are easily brushed on mold surfaces, and, due to their consistency, thicknesses up to 1/16-in. are easily obtainable in one application.

Hard and tough surface characteristics can be obtained with the use of these resins. The harder surface coat resins have provided better releasing and parting characteristics in the development work accomplished to date. Laminating or casting operations following application of the surface coat resins

should be accomplished prior to complete curing to insure good bonding.

▪ Inserts

It is sometimes necessary to place inserts in a plastic pattern or core box to facilitate its draw from the mold or sand. It might also be necessary to reinforce the plastic structure at a specific point or area. Best practice is to allow for and place these inserts during fabrication. If this is not possible they can be easily potted in or bonded to the finished pattern or core box with the epoxy resins.

▪ Curing the resins

Curing or hardening of the epoxy resins is very simple. In most cases they are room cured and will harden in a period of two to twelve hours. Complete cure for maximum strength at room temperature usually requires up to one week. Maximum strength can be obtained in two to three hours by curing in an oven at a temperature of 120 to 150 F after room curing.

▪ Machining of plastics

After a pattern or core box is complete and removed from the mold, machining of the excess plastic in the area of the top of the mold is required. Removal of the excess material is done in a router with carbide tipped router bits. The plastics can also be machined with little difficulty using conventional metal working machines and cutters. Minor trimming is readily accomplished with files, burrs, or abrasives.

PRODUCTION METHODS—CASTING

Two methods of casting are available for producing patterns of limited size and complexity

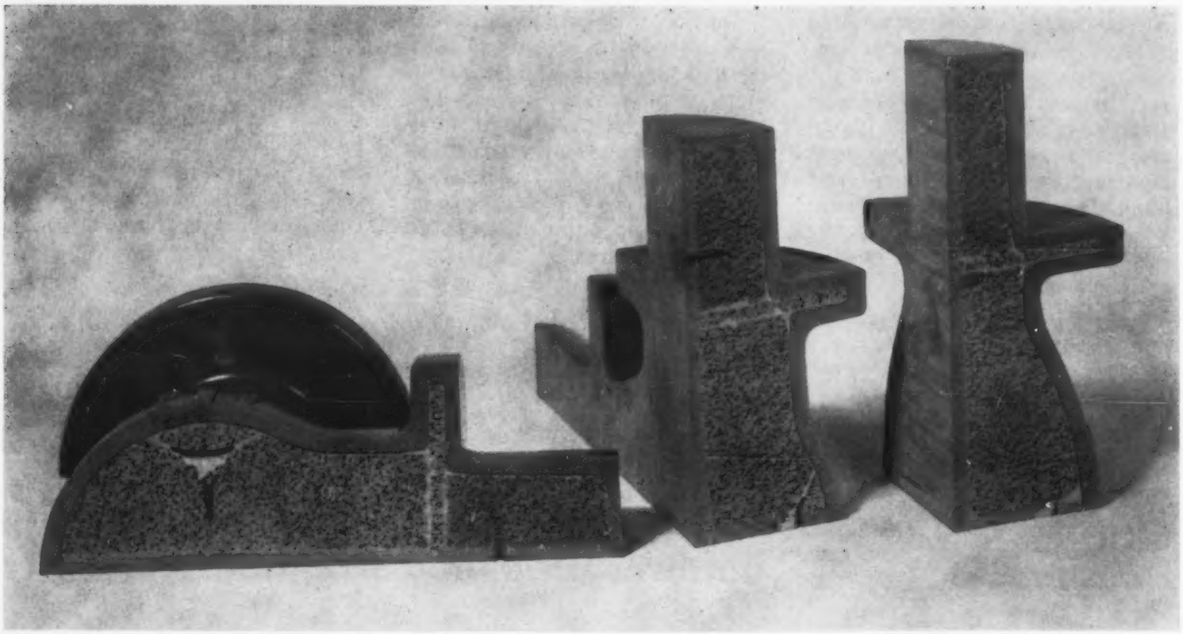
Epoxy resins shrink excessively if cast in too large a volume. Because of this shrinkage, patterns cast of solid resin are limited to small patterns and to patterns with uniform, limited cross-sectional thicknesses. Larger pieces may be cast using an inert core to limit the thickness and volume of resin.

▪ Solid casting method

The shrinkage that results, when attempting to make too large a pattern as a solid piece, must be kept in mind when selecting the method of fabrication. Aluminum-filled castings resin has been found to be a good plastic pattern casting material. Its surface and parting characteristics are as good or better than any other casting resin that the authors have used. However, it has its limitations. The maximum casting volume for shapes other than those of a uniform limited thickness is one pint. The aluminum-filled resin can be used in greater volume if the pattern has a uniform thickness of not more than 3/8-in. Up to 3/4-in. thicknesses are allowable if they are a small part of the total area of the pattern.

Manufacturing procedure. The following procedure is followed in

Solid cast plastic patterns are limited to thin pieces. This pattern, shown with its mold, is approximately ¼-in. thick.



Phenolic foam core is shown in this cross-section of a globe valve pattern. Surface coat is epoxy.

the solid casting method:

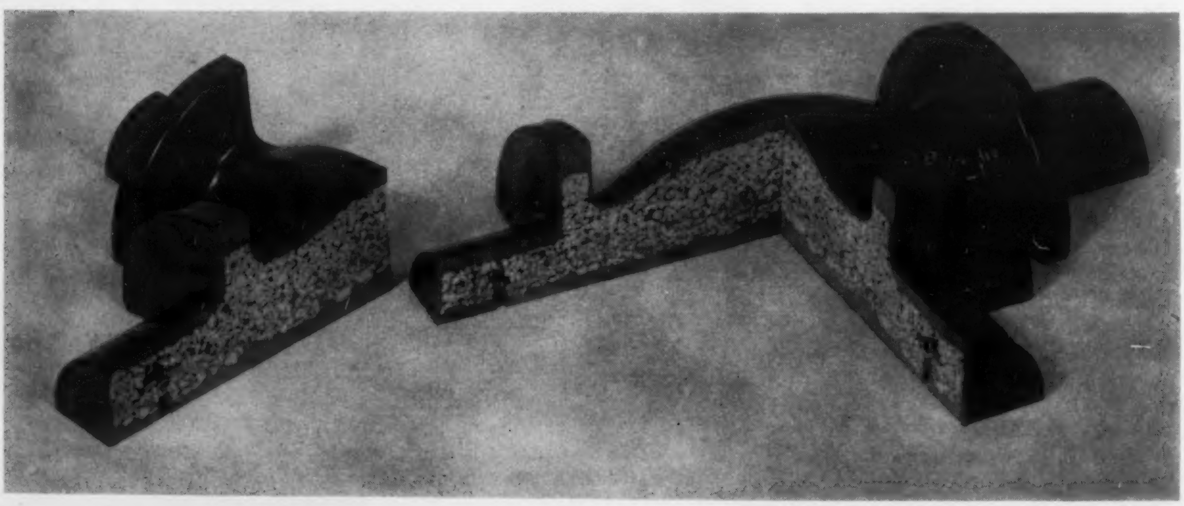
1. Build and prepare the mold as previously described.
2. Mix the casting resin as previously described.
3. Pour the casting resin into the mold. Fill the mold until it is overflowing and the resin height is slightly higher than the mold top.
4. Allow the resin to cure as previously described.
5. Remove the plastic pattern from the mold and machine off surplus material at the parting line. The pattern is now ready to be mounted on a board or for installation of dowel pins and draw or rapping plates.

Resins. Aluminum-filled casting resins have been applied to best advantage in this method.

■ **Casting with a core**

The practice of casting the resin

Popcorn core. Crushed popcorn makes an excellent core material, but it takes time to pop the corn.



over an inert core was developed to avoid the excessive shrinkage encountered with solid cast resin patterns. Generally this method is recommended for small and medium sized patterns and core boxes. Since the core is made to the general shape of the pattern or core box to be constructed, simple pattern shapes are most applicable to this method.

Manufacturing procedure. The following procedure is followed in the casting with core method of fabrication:

1. Manufacture and prepare the mold as previously described.

2. Fabricate a core roughly to the shape of the mold leaving 3/16 to 1/4-in. clearance on all sides. The use of various materials has indicated that wood can be used to best advantage for the core, pine being used by the authors. When used for a core, the wood must be dry with a moisture content of not more than seven per cent. Moisture content in excess of this affects the curing of the resin.

3. Fabricate a simple wooden bridge for the location and suspension of the core in the mold. This bridge can also be used for drawing the finished plastic pattern from the mold. A wooden core, mold, and bridge, prior to resin application, are illustrated.

4. Mix the casting resin as previously described.

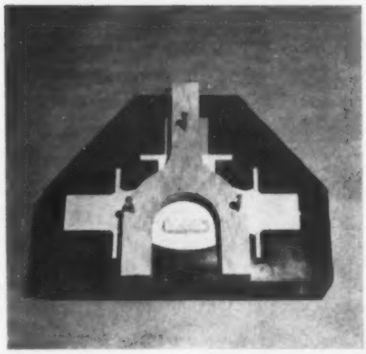
5. With core and bridge removed, pour part of the resin in the mold. This is accomplished so that when the core is placed in the mold, the resin is displaced and rises around the core. Initial pouring of resin with core in place could result in entrapped air, with resultant pockets or cavities in the finished pattern or core box.

6. Insert and place the core in the mold. Weight on the bridge is required to compensate for the buoyancy of the pine core in the plastic.

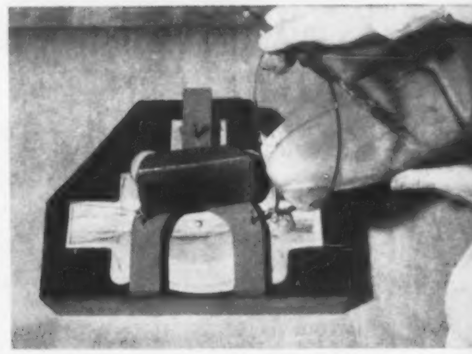
7. Pour the remaining casting resin into the mold until it is overflowing and resin height is slightly higher than that of the mold. The final pouring operation and core suspension is shown.

8. Allow the resin to cure as previously described.

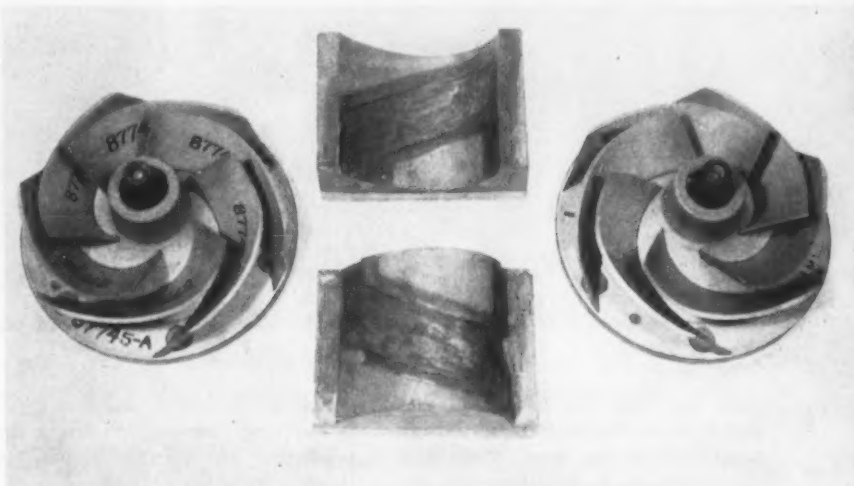
9. Remove the plastic pattern on



Pine core is suspended on the mold in proper position.

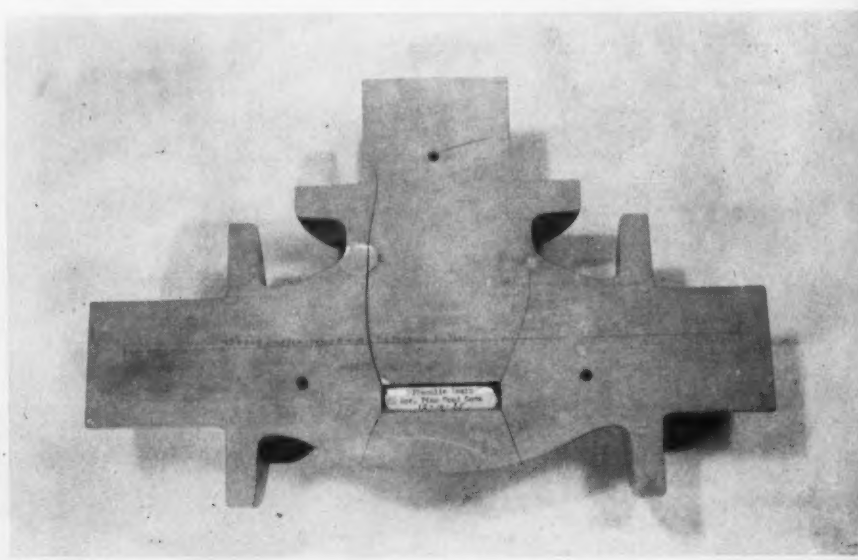


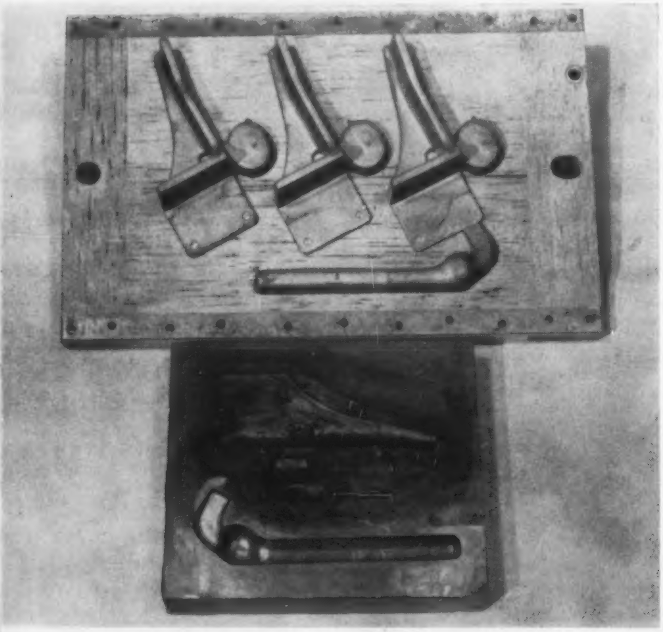
Next step is to pour casting resin into the prepared mold.



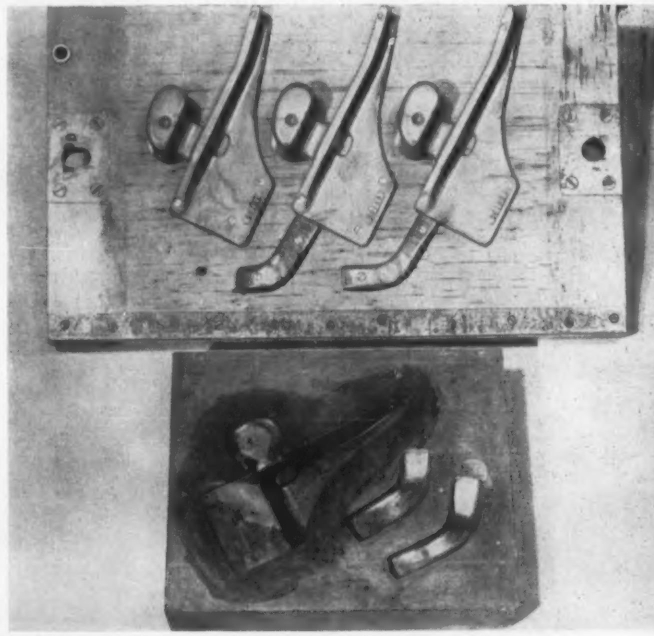
Cast plastic vanes are produced in the molds at the center of the picture. Vanes are then mounted for use on a portion of a core box.

Shrinkage caused cracks in the phenolic resin coating on this wood-cored pattern. Cracks developed two months after pattern was made.





Mold and drag side of plastic matchplate pattern.

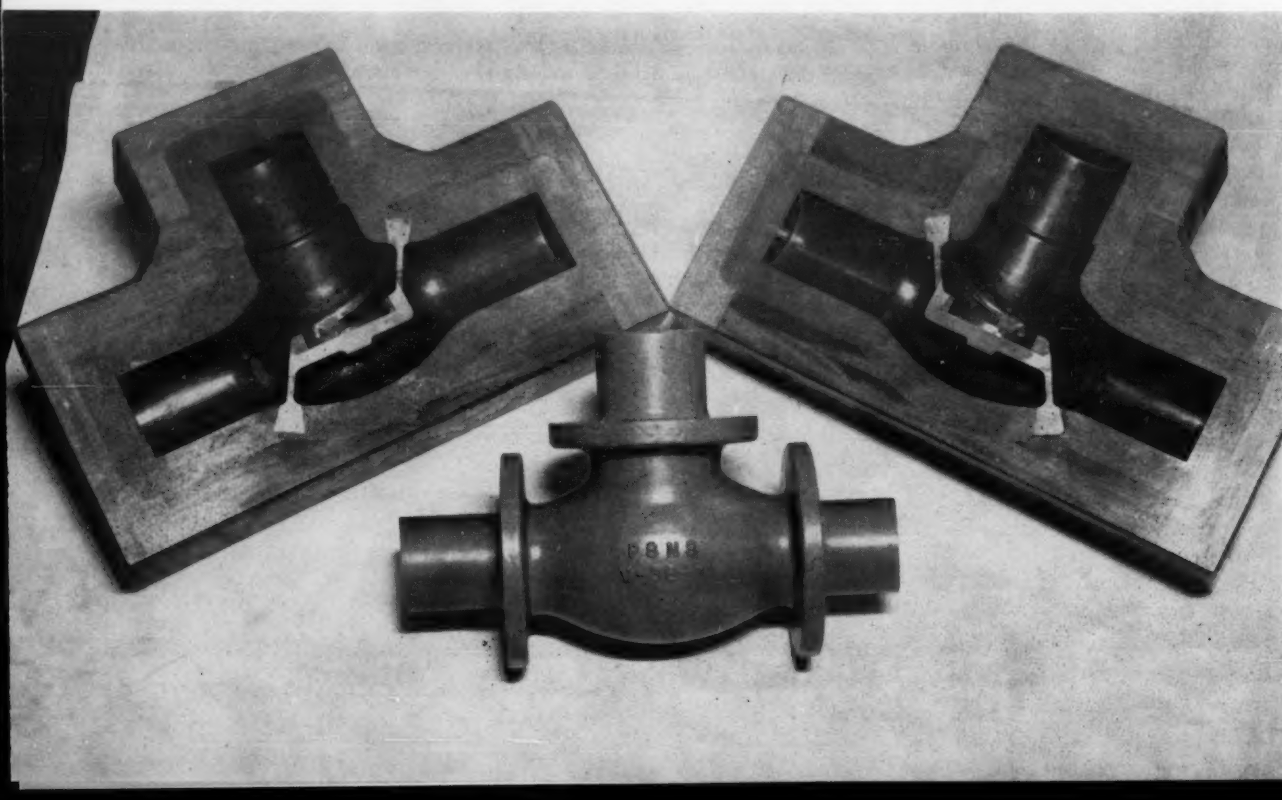


Mold and cope side of plastic matchplate pattern.

core box from the mold and machine off surplus material at parting line. Pattern is now ready for mounting on a board or for installation of dowel pins and draw or rapping plates. Core boxes are ready for use after machining of surplus material.

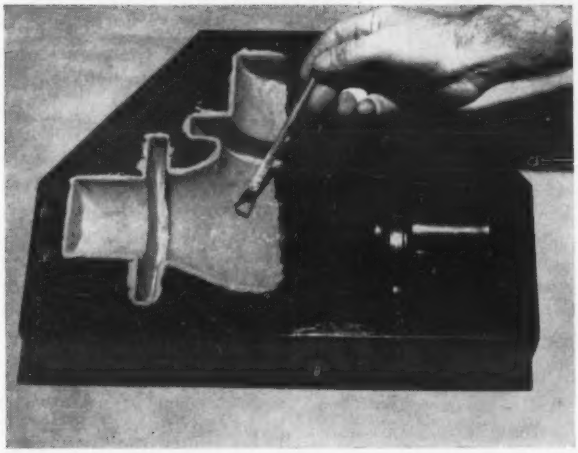
Resins. The resins employed for the cast with core method are identical to those used for the solid casting method.

Pattern and core boxes for a 2-in. low pressure globe valve were all produced in plastic.

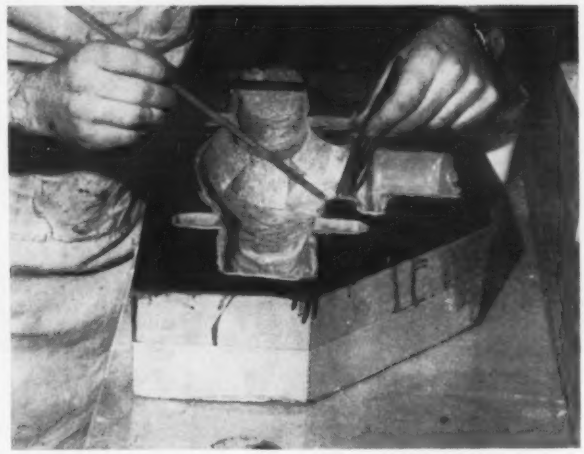


PRODUCTION METHODS— LAMINATING

For complex pattern jobs, the face and fill laminating method is rated tops



Face and fill method starts with brushing the first layer of surface coat resin into the mold.



Glass cloth patches are cut and placed on the second coat of facing or surface coat resin.

Patterns and core boxes of relatively complex shapes should be fabricated by the face and fill method of lamination. This method basically involves the lay up of a plastic laminated shell in the mold with the cavity or core of the shell filled with backup material. As was the case with the casting with core method, this method was developed to insure dimensional stability during fabrication. This method is identical to the casting with core method, but is done in reverse. This method of fabrication is applicable to any and all pattern and core box sizes. The filler applied after application of the plastic facing easily conforms to any shape. Surface characteristics of the facing resins employed are very good.

▪ Core materials

Of critical importance in the face

Core material is not poured until screws and plates for drawing the pattern are installed.

Polystyrene bead core is almost complete, but finished pattern will still need some machining.

Excess material at the pattern parting line is removed by routing.

Lamination meets the problems of even the biggest pattern jobs.

U. S. GYPSUM CO. PHOTO

and fill method are the filler and core materials used. Various materials including plaster, wood chips bonded with resin, sand and gravel bonded with resin, wood chips bonded with animal glue, and others have been used. The most satisfactory core materials have been those bonded with epoxy resins.

When using epoxy resin for the binding medium of the core material the same limitations that apply to the casting resins apply to the core. For example, if the core material is such that a comparatively large volume of resin is required, the heat of cure will rise to excessive temperatures and distort the facing applied to the mold. A good filler should have the properties of occupying a greater percentage of the volume than the resin (the larger the percentage the better), be non-absorbent, be of sufficient strength to support the outer plastic shell, be dimensionally stable, be capable of being machined, and be as light as possible.

Polystyrene beads and epoxy resin. In this core very small plastic beads are bonded with low exotherm epoxy resin. This filler is easier to mix and handle than the following popcorn filler and may be used to completely fill the mold. The bead core is also of a consistency that it has characteristics similar to wood, making possible the insertion of screws and nails. This is particularly desirable in the finishing or mounting of the pattern.

The only limitation on this core material is volume. Polystyrene beads, if heated to a high enough temperature, will expand to many times their original size. As a result, total volume of the core must be kept within limits. Volumes up to approximately one gallon of this material have been applied with no difficulty. Volumes in excess of this are not recommended. For core volumes of one gallon and less the polystyrene bead core is used to best advantage.

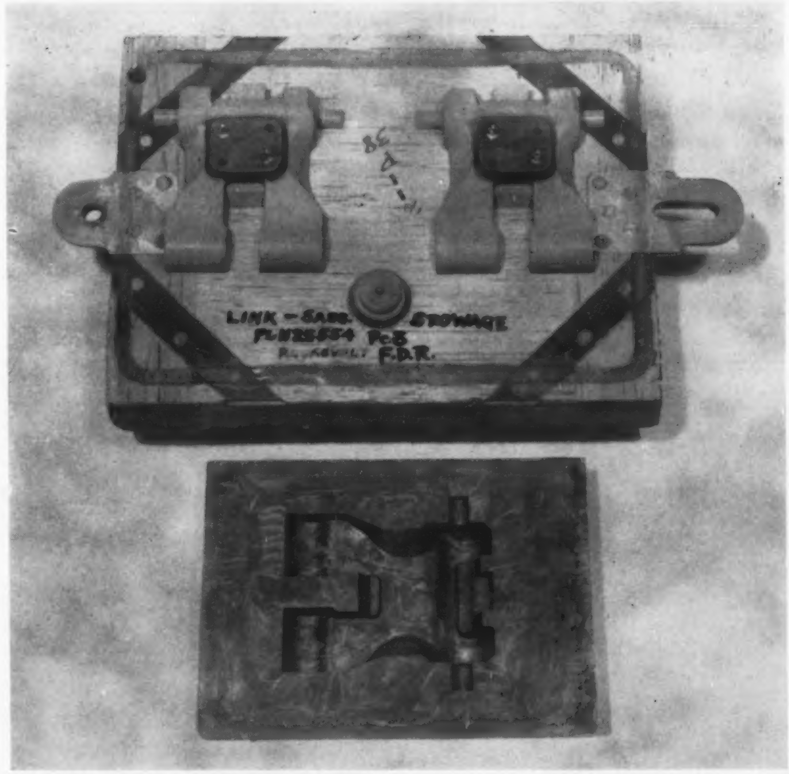
Mixing instructions: Weigh and mix the resin and hardener. When thoroughly mixed, slowly add the polystyrene beads to the resin.

When thoroughly blended, the bead and resin mixture can be poured into the cavity of the shell in the mold.

Popcorn and epoxy resin. This filler is recommended for large applications. Crushed popcorn mixed with a clear epoxy laminating resin provides a light and economical core material. Principal disadvantages in its use are time required to prepare the popcorn, the relative difficulty of mixing the popcorn with the resin binder, and the need of capping the top of the pattern or core box with casting resin. With the exception of these minor disadvantages recent application of this core material indicates that it is an excellent, light weight material suitable for large volume core application. Formulation and instructions on the mixing of the popcorn and resin core material are as follows:

Mixing instructions: Prepare popcorn by popping in a popcorn popper and crush the popped corn with a rolling pin in a shallow pan or box. Weigh the popcorn and place in a suitable container of sufficient size so that stirring can be easily accomplished. Weigh and mix the two resin ingredients and stir into the crushed popcorn. Stirring can be accomplished most effectively with a propeller mixer, or with a tumbling action similar to that obtained with a cement mixer. When the popcorn and resin are thoroughly blended the material is ready to pour into the cavity of the shell in the mold.

Core resins. Core resins are intended to be used in large volume and are now available. Basically they are an epoxy resin combined with a high percentage of filler or fillers. Their surface quality, when poured directly into a mold, is inferior to aluminum-filled casting resin and the surface coat resins. However results obtained indicate that they can be used to good advantage when used in conjunction with a surface coat resin. Volumes of approximately one gallon have been poured without excessive shrinkage with two of the resins. Maximum volume to which the resins can be used is not yet known. When used in the face and fill method, only one coating of surface resin is required prior to the addition of the core resin. This significantly simplifies the methods used with the polystyrene bead and popcorn fillers, and dependent upon volume, can result in reduced cost. Preparation of the core resins involves the weighing and mixing of the resin and hardener.

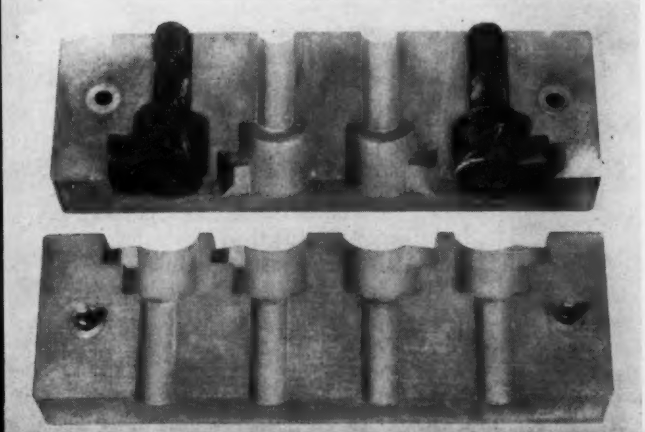


Mounted patterns for ship repair, above, were built up in this mold.

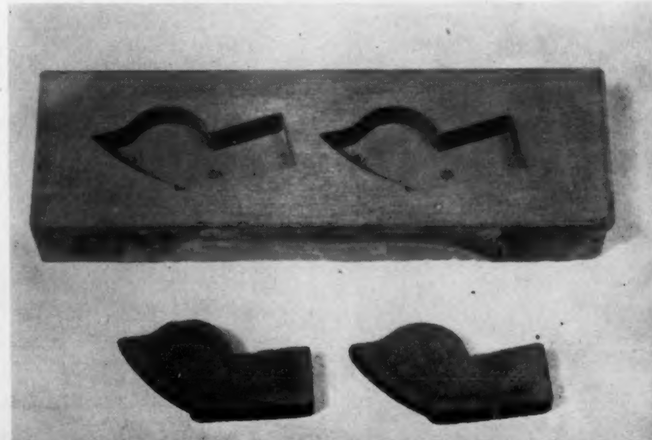
▪ Manufacturing procedure

The following procedure is fol-

Plastic core box contains two sample cores.



Vented box is for use on core blowing machine.



lowed in the face and fill method of fabrication:

1. Manufacture and prepare the mold as previously described.

2. Brush the first layer of surface coat resin on the mold.

3. If core resin is used as the filler material, allow the surface coat resin to cure to a tacky consistency and follow steps (5) through (9). If polystyrene bead or popcorn core materials are used, allow the first layer of surface coat resin to cure to a tacky consistency and brush on another layer of surface coat resin. Apply small patches of glass cloth on the second layer of surface coat resin, pressing the glass cloth into the resin. If inserts for drawing are required, their placement in this operation is recommended.

4. Allow the second layer of surface coat resin and glass cloth to cure to a tacky consistency and brush on a third layer of surface coat resin.

5. Prepare the core material as previously described.

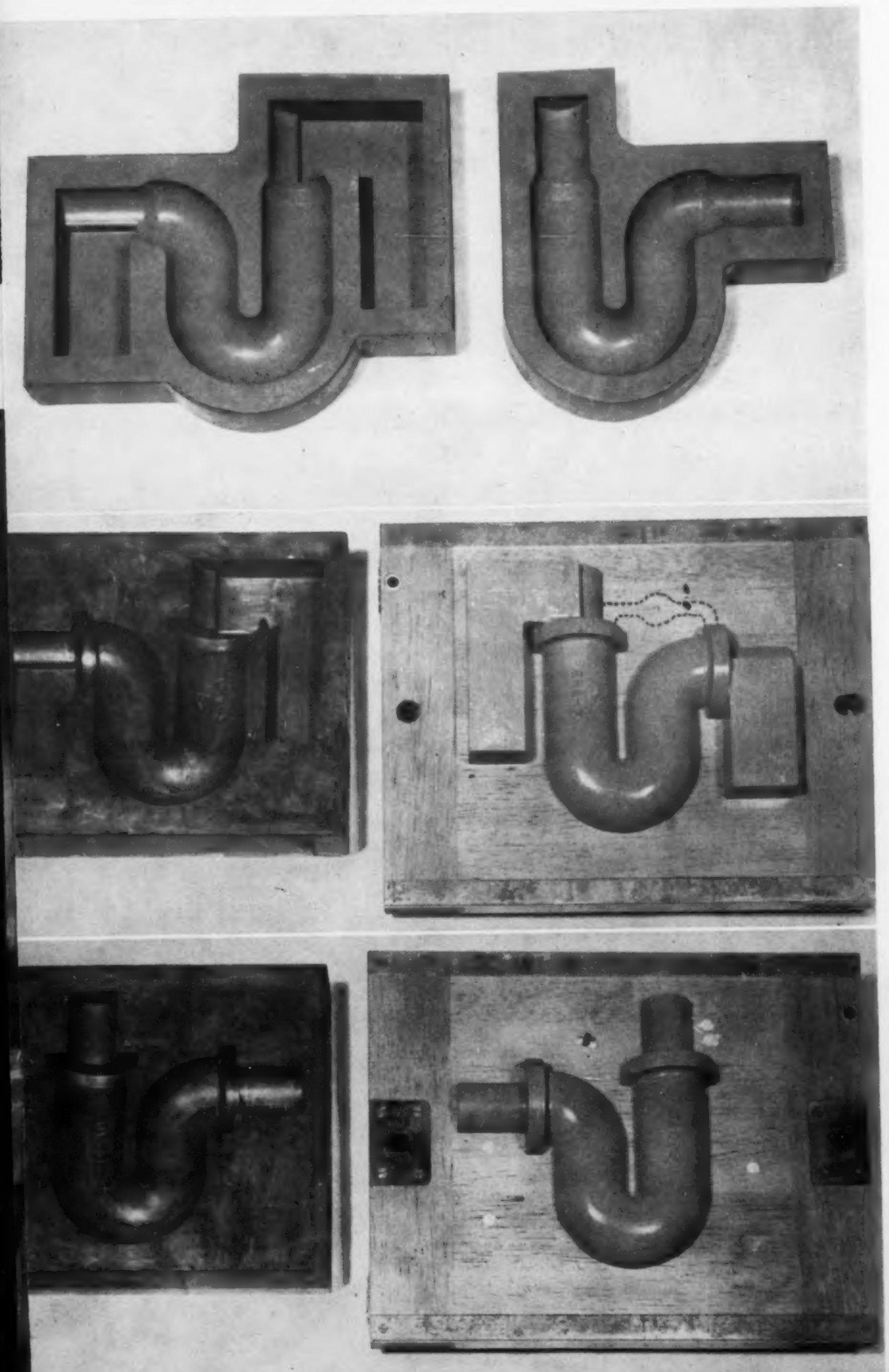
6. Pour the core material into the cavity of the mold. Note that best bonding of the core to the surface coat shell is obtained if the surface coat resin is cured to a tacky consistency when the core is added. If core resin or polystyrene beads are used as the core material, the mold cavity is completely filled. If popcorn filler is used, the cavity is filled to within 1/3 to 1/4-in. from the top of the mold so that it can be capped with casting resin after curing. Popcorn filler requires tamping when added to the mold cavity.

7. Allow the core material to cure.

8. If popcorn filler is used, cap the mold cavity with aluminum filled casting resin and allow to cure.

9. Remove the plastic pattern or core box from the mold and machine off surplus material at the parting line. Pattern is now ready for mounting on board, or for installation of dowel pins and draw or rapping plates. Core boxes are ready for use after machining off surplus material.

Complete pattern equipment made by laminating: top, core boxes; center, drag half of matchplate; bottom, cope half of matchplate.



▪ Resins

Core resins and materials have already been described. Preparation of the surface coat resins involves the weighing of resin and hardener in proportions provided, and mixing. Surface coat resins must be *hard* surface coat resins which give better surface and parting characteristics than other less hard surface coat resins. Aluminum-filled casting resin has also been

used as a surface coat resin. This is done by adding sufficient silica thickener to the resin to give it a putty-like consistency. Preparation and application of the casting resin in this manner makes possible the use of one resin for all methods of manufacture. This consideration is advantageous if very small resin volume is used. Surface and parting characteristics of the modified casting resin are not quite as good as the surface coat resins but are acceptable.

▪ Alternate methods

These methods of pattern and core box manufacture are those that have been used by the authors to best advantage. Alternate methods exist and are used, however these are the basic techniques.

PRODUCTION METHODS—PEOPLE and PLANT

Plastic pattern production means only minor changes in personnel and equipment

Plastic pattern and core box manufacture involves little change to conventional patternmaking principles. Plastics are simply a new material which can be applied to patterns and core boxes. Patternmakers require simple training for a short period in the handling and characteristics of the tooling resins. With little experience, the resins can be proficiently handled and applied. Pattern equipment to which the plastics are applied, the specific resin to be used, and the method of manufacture to be utilized are the most critical considerations. Assistance by engineering personnel familiar with the various resin types and limitations is initially desirable in these areas. Actual experience on several projects will effectively indicate these applications and method limitations.

Potential personnel hazards involved in the use of epoxy tooling materials are the fumes given off by the hardeners and solvents, and the effect of the hardeners on the skin. A forced draft exhaust fan is recommended for the elimination of solvent and hardener fumes. Provision of this equipment will preclude any personnel hazard in this regard.

Exhaust fans may be installed in the wall or the roof of the pattern shop. A suitable fan for roof installation is illustrated.

The function of the exhaust fan is to dilute the irritating fumes of the solvent and amine hardener used with the resin. To determine the correct fan necessary to ventilate any individual patternmaking operation, the following formula presented in the recent American Foundrymen's Society publication *Engineering Manual for Control of In-Plant Environment in Foundries* should be used.

$$Q = \frac{0.81 \times 1000000 \times S}{WC}$$

where

Q = Ventilation rate in cfm required to dilute the atmosphere

S = Amount of spillage and evaporation in lb/8 hr day

W = Molecular weight of solvent (58.09 for acetone, 72.10 for ethyl methyl ketone (Butanone)

C = Maximum allowable concentration. Calculation should be based on the allowance for Butanone: 250 parts per million

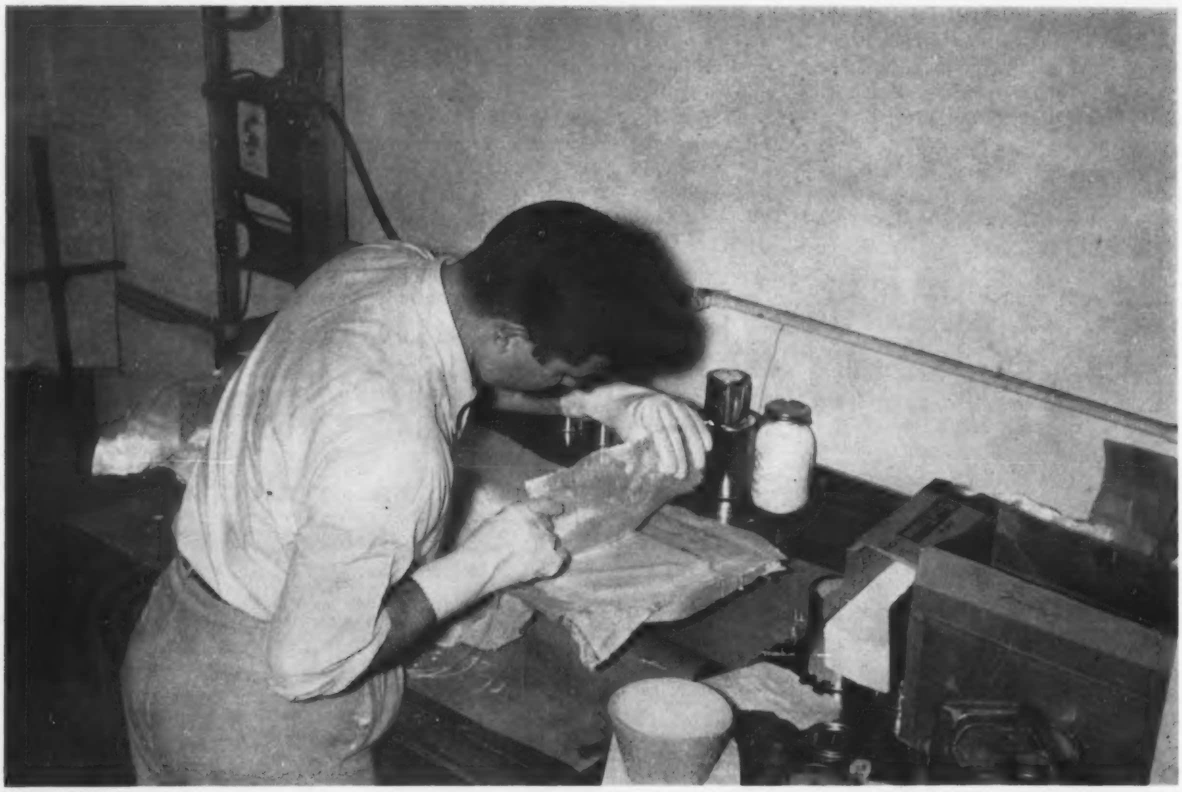
The amine hardeners used can cause skin irritation and dermatitis. Provision of gloves and protective clothing to be used when handling the hardeners and resins will keep skin irritations to a minimum.

Personnel should also be required to frequently wash their hands with warm water and soap to remove any of the materials that may accidentally get on the hands. In addition, the glass cloth and fibers used may lead to dermatitis. The use of gloves while handling the cloth and fibers is recommended if personnel are allergic to the glass. It is noted that plastic coated canvas gloves have been found to be most effective.

Plant equipment. Epoxy tooling resins can be used without any special plant equipment. This is a definite advantage when considering their use for plastic patterns and core boxes. They are easily machined on conventional woodworking and metalworking patternmaking equipment. Special equipment that should be installed is a forced draft fan in the mixing and lay up area to carry away the hardener and solvent fumes, and scales for the weighing of the resin and hardener. A curing oven for the curing of phenolic resin coatings and the accelerated curing of the epoxy resins is considered desirable.

Miscellaneous equipment. Mis-

Forced draft exhaust fan for installation in roof.



U. S. GYPSUM CO. PHOTO

Gloves are a must for most people who handle the resins, but resins have no effect on many others. Amine hardeners cause the irritation and plastics suppliers are working on a solution to the problem.

cellaneous equipment used in the handling of the resins and manufacture of patterns and core boxes is as follows:

Standard loose and hand tools—files, rasps, screwdrivers, hammers, etc.

Disposable containers—disposable containers, such as paper drinking cups and larger paper containers or tin cans are required for the mixing of the resin.

Paint brushes—required for the application of surface coat and laminating resins. Inexpensive brushes in a two in. size are recommended.

Spray Gun—required for the application of parting agents.

Paddles—required for the mixing of resins and core materials. Wooden paddles are often used.

Suggested Reading

Artz, Ted, "Glass Cloth Gives Old Patterns New Life," MODERN CASTINGS, v 29, April 1956, p 72.

Dunn, W. C. H., "Experiences with Plastics in Patternmaking Practice," MODERN CASTINGS (American Foundryman), v 25, June 1954, p 82.

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Shryer, D. M., "Epoxy Tooling for the Pattern and Foundry Industry," *Modern Patternmaking*, v 5, January-February 1957, pp 4-5.

Stark, W. M., "Advanced Applications of Casting Resins," *Automotive Industries*, v 102, January 15, 1950, pp 39, 102, 104.

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SOLVING WEIGHT and PRODUCTION PROBLEMS with Mg

Robert E. Short / *Chief Metallurgist*
Kleinschmidt Laboratories, Inc.

Magnesium's casting, drawing qualities make possible a rugged 48 lb military teleprinter

Fig. 1 . . Magnesium frame parts and deep drawn hoods provide protection against severe conditions in field.

Given the problem of producing a rugged, light-weight page printer for the Signal Corps, Kleinschmidt Laboratories, Inc., Deerfield, Ill., found magnesium an ideal metal. Magnesium is used for frames which are sand cast and also for deep drawn parts for covers. Some use is also made of flat stampings, die castings and one impact extrusion.

Designed for tactical use, the specifications call for a machine weighing less than 48 lb and able to withstand dropping in parachutes and immersion in water. Magnesium has worked well because of its light weight and increased machinability.

Figure 1 shows the teleprinter fastened to a pack board. The magnesium cover offers protection during transportation. Figure 2 shows the machine set up for operation. The weight of the unit is 47.5 lb.

Later, a companion piece of equipment was developed for the page printer; a typing perforator weighing only 97 lb. These two pieces weighing 134.5 lb, replaced what originally weighed over 600 lb.

Castings are purchased from R. C. Hitchcock & Sons, Inc., Minneapolis, Minn., and close liaison is required because of the rigid specifications. Designs must be checked for conformance to a vibration specification. This requires that

Fig. 2 . . Quick removal of cover allows operator to get into action fast. Page printer remains on carrying board.

they do not cause resonance when subjected to certain vibrating frequencies.

After the initial design, sample castings are made from wood patterns. Tests are made to be certain specifications are met and then final drawings are made. Metal match plates are used for production runs.

Sand castings are made using alloy AZ 63A (6 per cent Al-3 per cent Zn) in the heat treated and aged condition. They are usually supplied with a chrome-pickle finish as protection against corrosion during shipping and handling.

Machining allowances are usually 1/16 in. Due to the ease of machining, this amount of metal is removed in one cut to establish a true surface.

After machining, all castings are

Fig. 3 . . Machinability of magnesium allows drilling and tapping to be done in multiple step operations.

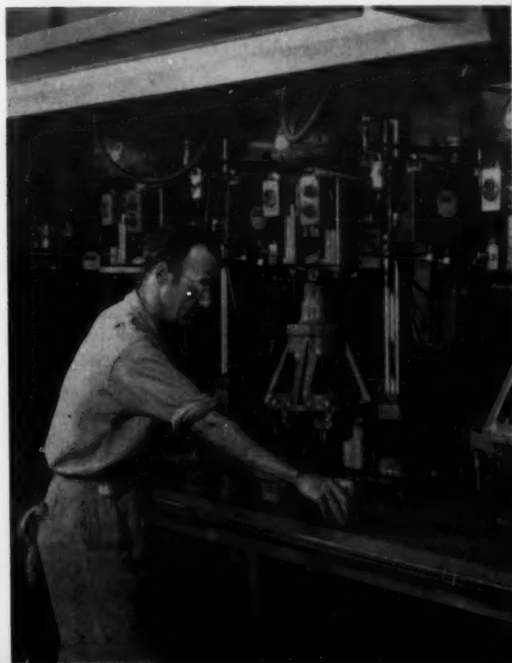


Fig. 4 . . Close tolerances are held on drilling operations. In some cases hole diameters are maintained at ±0.005 in.

given a dichromate treatment and painted. Dichromating requires rigid control of the processing tanks. Trouble may be caused by contamination of the solutions or incorrect concentration of the desired chemicals.

Two difficulties, other than dimensional tolerances, are foundry problems. One is flux inclusions. Since melting must be done under a protective flux, techniques had to be developed to exclude the flux from the cast metal. If included in the castings, the chlorides in the flux cause voluminous corrosion products to develop. Castings are subjected to a 24-hour humidity test. The presence of flux is indicated by the large amount of corrosion products which develop.

The second difficulty is the presence of iron in the casting surface. This results from blast cleaning with steel grit. Although this is the most practical cleaning method, insufficient pickling, after cleaning may leave the surface contaminated. The iron particles cause galvanic corrosion on the surface particularly in a humid atmosphere. The presence of iron can be detected with a simple chemical test.

Close tolerances are held. For example, center distances between two holes on opposite sides of a casting, 9.906 in. apart are held to ±0.002 in. The diameter of several holes is held to ±0.0005 in.

Drilling and tapping operations are carried out in multiple steps. Figure 3 shows a drilling operation about to be performed. A casting has been located in the fixture and the fixture, in turn, located on the drill press table. Figure 4 shows the results of the drilling operations on a keyboard casting.

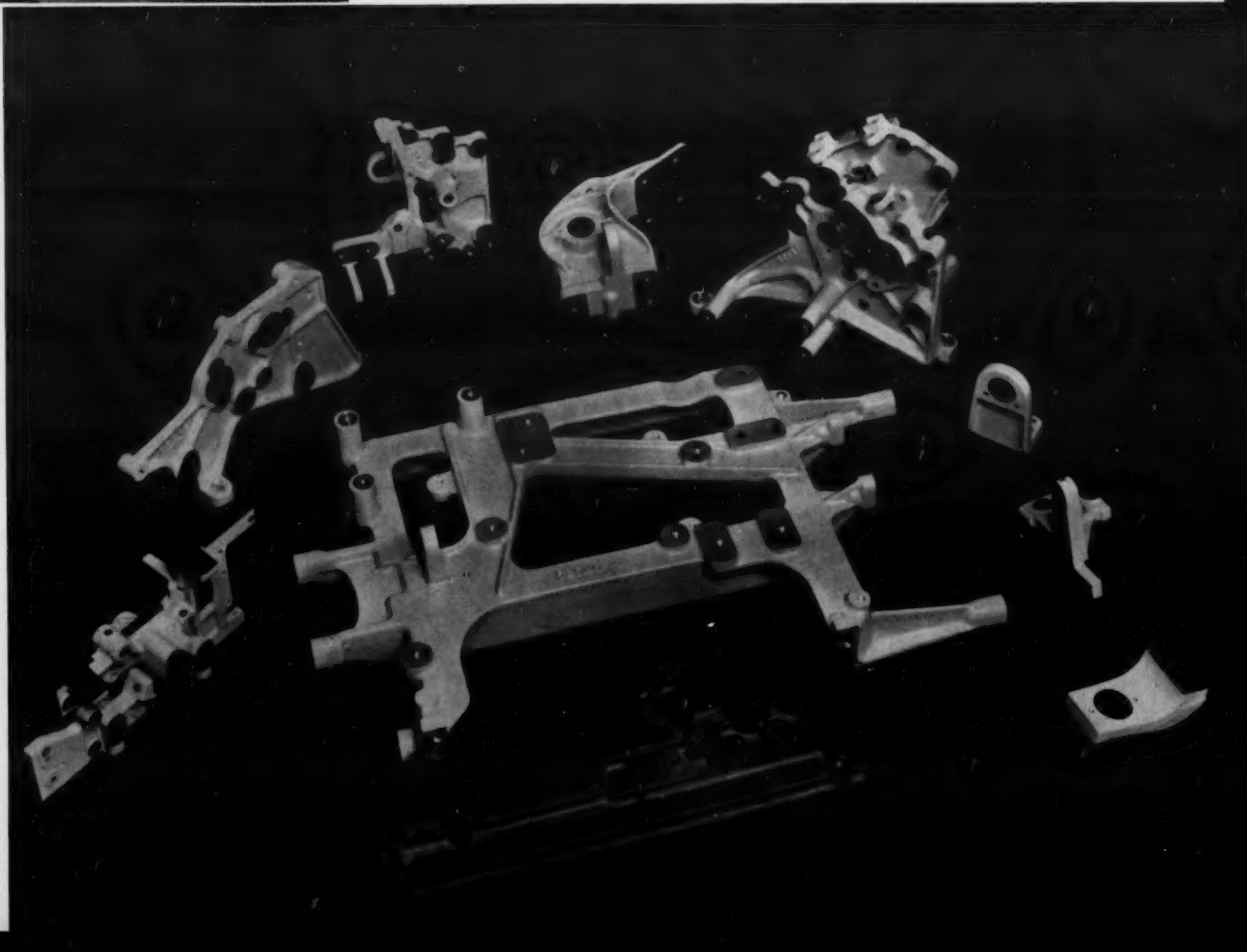
Figure 5 shows the comparative size and shape of magnesium castings. The largest is 17 in. wide, 18¾ in. deep and 2 in. high. It weighs 4½ lb. The smallest weighs about an ounce.

All AZ 31A (3 per cent Al, 1 per cent Zn) annealed sheet is mused for covers and cases. Drawing is done with heated sheet and dies.

The drawability of magnesium enables this process to be done in one operation. Probably three operations would be required with steel or aluminum with additional tooling and intermediate annealing operations. After deep drawing, the cover, while still hot, has the flash sheared from one side. Finishing consists of dichromating, priming and painting.

One particular magnesium cover weighs 3 lb, 13 oz; if made of aluminum it would weigh 5 lb., 12 oz; its weight in steel would be about 18 lb.

Fig. 5 . . Ability to produce intricate shapes by casting is shown by wide range of magnesium parts weighing from 1 oz to 4½ lbs.



ALLOYS TO X-RAYS

will be on display at the AFS Castings Congress and Engineered Casting Show

Exhibits ranging from alloys to x-ray by exhibitors from California to Connecticut will be featured at the 61st AFS Castings Congress combined with the 1st Engineered Castings Show to be held May 6-10 at the Cincinnati Music Hall, Cincinnati.

Included will be educational exhibits and operating exhibits. Castings will be shown from the design stage to finished product and from raw materials to final testing, including an x-ray demonstration. Newer areas for castings will be shown by ferrous and non-ferrous castings used in guided missiles and electronic devices for aircraft.

Casting processes featured will be precision, sand, permanent mold, investment, shell, centrifugal and operating die-casting demonstration. Process control equipment includes x-ray, physical testing, metallurgical analysis, visual inspection, non-destructive testing, hardness testers, and production control.

Also on exhibit will be core boxes, wood, metal and plastic patterns and match plates.

Castings will range in size from thin sections and light gray iron pieces to heavy machine tool gray iron castings. Metals used will be aluminum, brass, magnesium, gray iron, alloy iron, chromium-molybdenum, zinc, beryllium copper, malleable iron, ductile iron, pearlitic iron and titanium.

The registration fee is $2, the usual AFS member fee, for any exhibitor customers or prospects regardless of AFS affiliation. Registration cards have been mailed to all AFS members. During the Engineered Castings Show and Castings Congress, registration may be made at either the Cincinnati Music Hall or the Netherlands-Hilton Hotel.

Housing registration forms have been mailed to all AFS members. These should be sent directly to the Housing Bureau at Cincinnati, not to the AFS Central office.

The Castings Show has been developed around the theme "Quality, Utility, Economy of Cast Metals." This will be carried out in the Castings Congress as well. The programs have been designed to inform buyers and designers of castings of the utility and application of castings. Exhibitors will have engineers on hand to discuss problems concerning castings and pattern requirements.

Advance registration cards may be found on page 85 of the February issue of MODERN CASTINGS.

They'll be in Cincinnati

Engineered Castings Show Exhibitors

Acme Precision Castings Co.
Dayton, Ohio
Al-Fin Div., Fairchild Engine & Airplane Corp.
Long Island, N. Y.
Alloy Steel Castings Co.
Southhampton, Pa.
Alten Foundry & Machine Works
Lancaster, Ohio
Aluminum Company of America
Pittsburgh, Pa.
American Alloys Corp.
Kansas City, Mo.
American Brake Shoe Co.
New York, N. Y.
American Light Alloys Corp.
Little Falls, N. J.
American Smelting & Refining Co.
New York, N. Y.
Holger Andreasen, Inc.
San Francisco, Calif.
Apex Smelting Co.
Chicago, Ill.
Arwood Precision Castings Corp.
New York, N. Y.
Arrow Aluminum Castings Co.
Cleveland, Ohio
G. A. Avril Co.
Cincinnati, Ohio
Morris Bean & Co.
Yellow Springs, Ohio
Bendix Foundries, Bendix Aviation Corp.
Teterboro, N. J.
Brown Foundry Corp.
Camden, N. J.
Brush Beryllium Co.
Cleveland, Ohio
Buckeye Foundry Co.
Cincinnati, Ohio
The Budd Co.
Philadelphia, Pa.
Campbell-Hausfeld Co.
Harrison, Ohio
City Pattern & Foundry Co.
South Bend, Ind.
Climax Molybdenum Co.
New York, N. Y.
Dayton X-ray Co.
Dayton, Ohio
H. W. Dietert Co.
Detroit, Mich.
Dike-O-Seal, Inc.
Chicago, Ill.
Dixie Bronze Co.
Birmingham, Ala.
Doehler-Jarvis Div., National Lead Co.
New York, N. Y.

Continued on page 56

CIRCLE NO. 146, PAGE 7-8

List of Exhibitors

Continued from page 55

Duriron Co.
Dayton, Ohio
Eastern Malleable Iron Co.
Naugatuck, Conn.
Eaton Manufacturing Co.
Vassar, Mich.
Eder Instrument Co.
Chicago, Ill.
Electro Metallurgical Co.
New York, N. Y.
Chris Erhart Foundry & Machine Co.
Cincinnati, Ohio
Fabricast Div., General Motors Corp.
Bedford, Ind.
Fairchild Engine & Airplane Corp.
Long Island, N. Y.
Federated Metals Div., American Smelting & Refining Co.
New York, N. Y.
General Motors Corp.
Bedford, Ind.
Gibson & Kirk Co.
Baltimore, Md.
Grede Foundries, Inc.
Milwaukee, Wis.
Samuel Greenfield Co.
Buffalo, N. Y.
Hamilton Brass & Aluminum Castings Co.
Hamilton, Ohio
Hamilton Foundry & Machine Co.
Hamilton, Ohio
Hansell Elcock Co.
Chicago, Ill.
Benj. Harris & Co.
Chicago Heights, Ill.
Howard Foundry Co.
Chicago, Ill.
International Nickel Co.
New York, N. Y.
Janney Cylinder Co.
Philadelphia, Pa.
Kaiser Aluminum & Chemical Sales, Inc.
Chicago, Ill.
Keokuk Steel Castings Co.
Keokuk, Iowa
King Tester Corp.
Philadelphia, Pa.
H. Kramer & Co.
Chicago, Ill.
R. Lavin & Sons, Inc.
Chicago, Ill.
Lebanon Steel Foundry Co.
Lebanon, Pa.
Love Brothers
Aurora, Ill.
Lynchburg Foundry Co.
Lynchburg, Va.
Magnaflux Corp.
Chicago, Ill.
Marion Machine Foundry & Supply Co.
Marion, Ind.
Meehanite Metal Corp.
New Rochelle, N. Y.

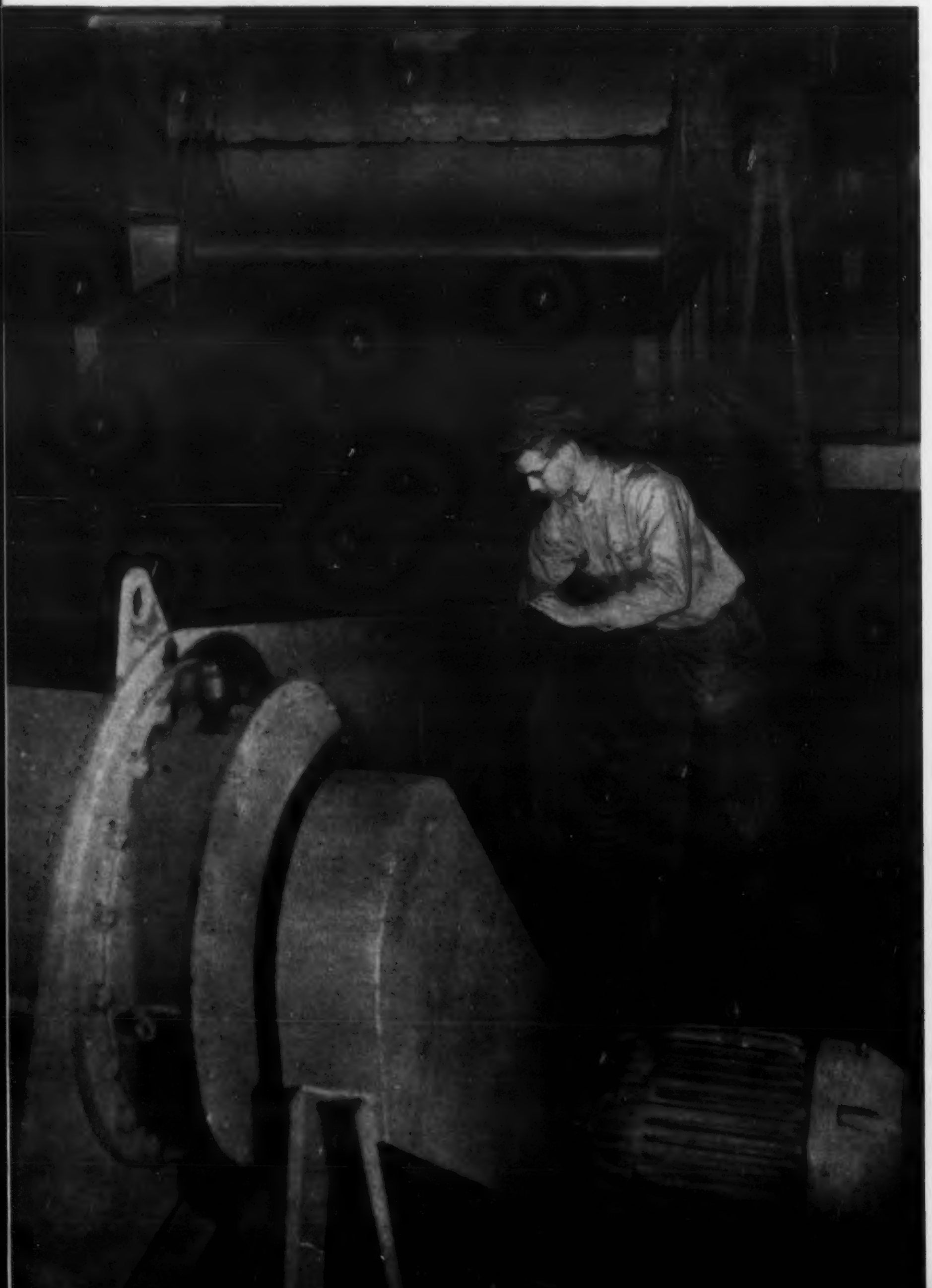
Midwestern Foundries, Inc.
Garrett, Ind.
Modern Pattern & Plastics, Inc.
Toledo, Ohio
Motor Castings Co.
Milwaukee, Wis.
Mueller Industries, Inc.
Aurora, Ill.
Nassau Smelting & Refining Co., Inc.
Staten Island, N. Y.
National Engineering Co.
Chicago, Ill.
National Lead Co.
New York, N. Y.
Non-Ferrous Foundries, Inc.
Indianapolis, Ind.
Oregon Metallurgical Corp.
Depew, N. Y.
Peerless Foundry Co.
Cincinnati, Ohio
Peoria Malleable Iron Co.
Peoria, Ill.
"Precision Metal Molding"
Cleveland, Ohio
Pressco Co.
Chesterton, Ind.
Pyott Foundry & Machine Co.
Aurora, Ill.
Quality Aluminum Castings Co.
Waukesha, Wis.
Reliable Castings Corp.
Cincinnati, Ohio
Roessing Bronze Co.
Pittsburgh, Pa.
Rolle Manufacturing Co.
Lansdale, Pa.
I. Schumann & Co.
Cleveland, Ohio
Scientific Cast Products Co.
Cleveland, Ohio
Sipi Metals Corp.
Chicago, Ill.
Sivyer Steel Casting Co.
Milwaukee, Wis.
Southern Precision Pattern Works
Birmingham, Ala.
Sterling Casting Corp.
Bluffton, Ind.
Superior Foundry Co.
Cleveland, Ohio
Swedish Crucible Steel Co.
Detroit, Mich.
Symington-Gould Corp.
Depew, N. Y.
Union Carbide & Carbon Corp.
New York, N. Y.
United States Gypsum Co.
Chicago, Ill.
Universal Castings Co.
Chicago, Ill.
Wadsworth Foundry Co.
Wadsworth, Ohio
Wagner Malleable Iron Co.
Decatur, Ill.
Waukesha Foundry Co.
Waukesha, Wis.
Wilmington Casting Co.
Wilmington, Ohio
Zenith Foundry Co.
Milwaukee, Wis.

COOLING HOT SHOT for SHELL BACKING

A. J. Hall / *Dist. Mgr., Cleveland*
Hewitt-Robins, Inc.

Equipment and handling costs cut 50 per cent with materials system

Use of metal shot for abrasive cleaning makes it readily available for back-up material. Shot is easily conveyed and separated.



Screened and air cooled shot eliminates safety hazards and high costs which have held back the use of shot as a backing material for shell molding.

The system is used at several foundries, including Lynchburg Foundry Co., Lynchburg, Va., where the photographs were taken.

Metal shot is commonly used in foundries for abrasive cleaning and is readily available as a back-up material. In addition it is conveniently handled in bins, bucket conveyors, belts and vibrators, and is easily separated from the sand since the shot is considerably larger than sand grains.

Shot should be compacted to form a dense back-up. This is usually done by vibrators. The shot is settled to prevent opening of the mold at the parting line and to limit mold wall movement caused by molten metal pressure.

The denser the metal and heavier the casting, the more important it is to back up the shot to prevent swelling. This hydrostatic pressure of molten metal increases with the height of the casting and density of the metal poured. Thus more care should be taken in backing up steel and iron than would be required with aluminum castings.

Shot also has a high permeability characteristic compared to other back-up materials which are apt to pack to the point of seriously interfering with passage of the large amount of mold gases generated when molten metal comes in contact with the combustible resin binder.

For metals whose physical properties are improved by rapid solidification, molds should be backed with metal shot because its chilling action and thermal conductivity is superior to that of dry sand or other granular refractory materials.

To avoid loss of shot, care should be exercised to avoid metal spillage during pouring and to protect the metal shot from being exposed to molten metal contact.

Principal objections to the use of shot as a backing material have usually been: high initial cost of handling equipment; high maintenance costs of equipment; safety (shot spillage on the floor) and the high cost of shot.

By using shot for backing it is possible to eliminate the expensive time-consuming practice of joining the two mold halves together with a number of bolts and nuts.

This system has reduced the initial cost of separating and cooling equipment by about 50 per cent and the operating and maintenance cost about the same. The method is also more flexible and can be installed in less space than previous methods.

The flow diagram shows the operations of the system.

The shot is first separated from the castings and then cleaned to remove sand and flashing. The average temperature in this installation is about 300 F. Material is separated by a special double deck vibrating shot screen. The top deck being a scalping deck for flashing and large pieces of shell. About 150 tons per hour are handled. Smaller pieces of shell which pass through the scalping deck are pulverized while the shot passes over the lower cleaning deck. Large volumes of air are used to clean shot on the lower deck. Use of air on the lower deck of the shot separating screen provides some initial cooling. Thus

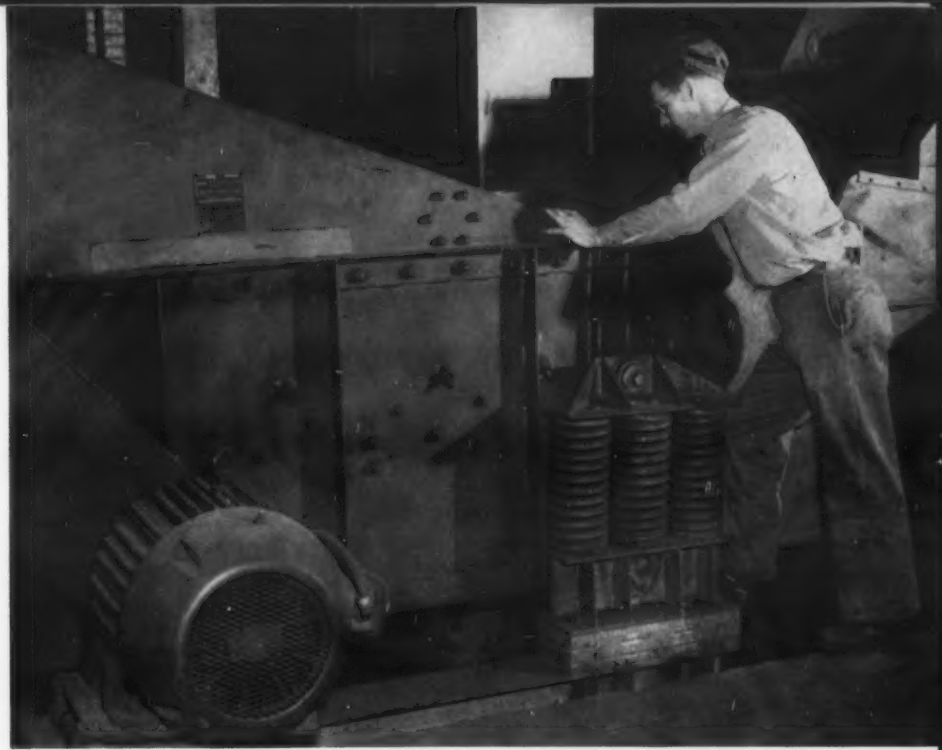
the unit performs a dual function of separating and providing a degree of cooling.

The clean shot is next put over single deck vibrating shot cooling units. The number of units depends on the temperature of the shot and tons per hour to be handled. When passing large volumes of air at room temperature through a controlled depth of material, an efficient heat exchange is effected.

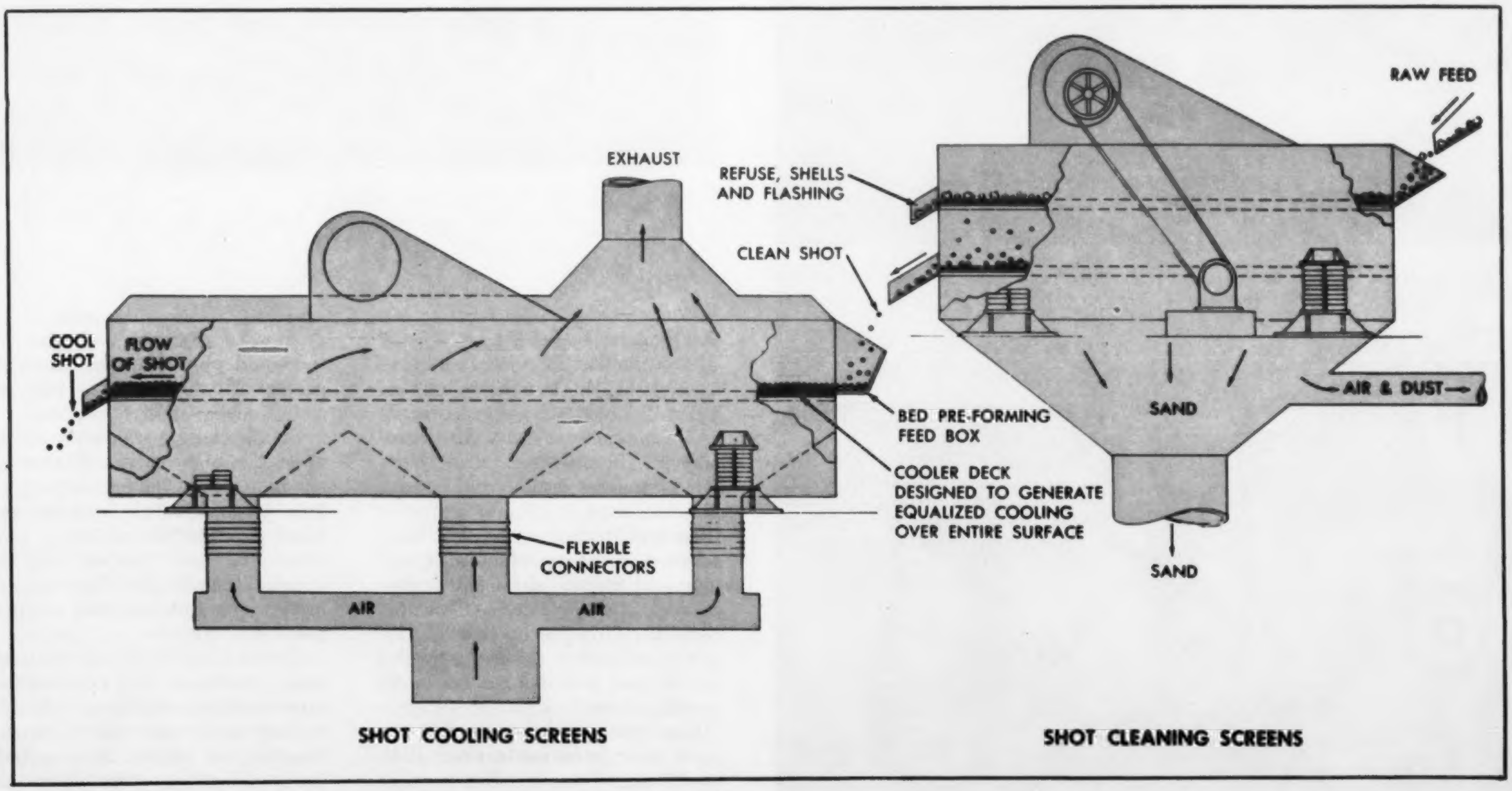
No water is used in the system. However, in cases of handling shot of extreme temperatures, it is possible to use water to aid in speeding cooling operations. The principle insures a clean, dry shot, eliminating objections to the use of water for this purpose.

While conventional type horizontal vibrating screens are used, this is not an ordinary screening application. Care must be used in designing the decks so they will stand up under this severe service, since the material weighs about three times that normally handled by this equipment. In addition, the speed and stroke of vibrating equipment must be suited to the particular application to control the material properly, to make the material travel horizontally at the correct rate without undue agitation and to use air efficiently for cooling. Proper control of the air is also necessary to insure uniform flow through the material in the volumes necessary.

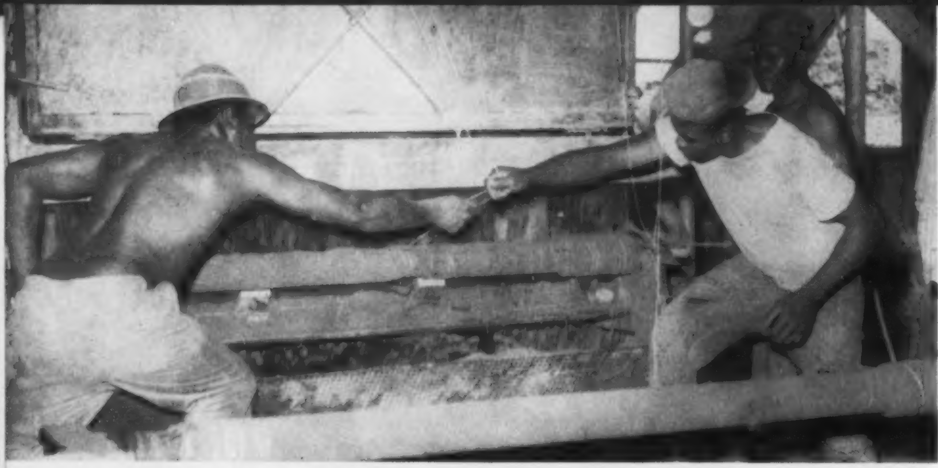
The principle is not new but merely uses air for cooling and vibrating equipment for conveying, screening and handling the material. The system and equipment used are of basic design but engineered to suit the job and work properly and efficiently. It is not recommended that existing equipment be modified or attempts made to fabricate such a system in the field.



Equipment is of standard design but must be engineered to fit each job. Air is used for cooling and vibrating equipment for handling.



Shot is first separated from castings, then cleaned to remove sand and flashing. About 150 tons are handled hourly, temperature averages 300 F.



String is added to sand core for additional strength. Core for 5 ft pipe length is gradually built-up by adding sand to revolving arbor.

Carbon injection process was adopted after difficulty in getting local pig iron. Satisfactory iron is obtained from 100 per cent scrap.

After cleaning, pipe is inspected, ground and hydro-tested for pin holes and imperfections. Tar is applied after pipe has been heated.

DIVERSIFICATION SPEEDS GROWTH OF WESTERN FOUNDRY CO.

Former gray iron foundry produces cast soil pipe, fittings and plumbing specialties

ROBERT RUSHING / *Public Relations Dir. Western Foundry Co., Tyler, Texas*

From its beginning as a gray iron jobbing foundry employing 25 in 1943, Western Foundry Co., Tyler, Texas, has become a diversified manufacturer with 1000 employees. Production comes from three foundries, fittings and burner, pipe and brass.

Several techniques have been adopted in the manufacture of soil pipe and fittings, stove and heater castings and specialties. These include the CO_2 process, carbide injection of scrap charges and the use of sand and string cores made on iron arbors.

Cast iron gas burner and stove parts have been made since 1943 by Western Foundry. However, in 1948 it began its diversification by building a new plant for the production of cast iron soil pipe, fittings and plumbing specialties. At present 300 tons of gray iron are melted daily in two cupolas.

Cupola charging is done with the assistance of a mobile electromagnet and crane. Charges are dumped into ground level buckets and transported to the charging level where they are dumped into the cupolas. Usually 2000 lb charges of metal, coke and limestone are prepared in one bucket.

Due to the difficulty of obtaining local pig iron in 1955, considerable experimenting was done with the carbide injection process for its continuous pour cupola. Now carbide and powdered graphite blown into the molten metal by nitrogen raises the carbon and reduces the sul-

Crucibles are used in melting yellow and red brass for plumbing fixtures. Pots are degassed with nitrogen before pouring off.

Cores for Western Foundry's brass products are made with the CO_2 process. Castings are triple-plated with copper, nickel, chrome.

Cast iron soil pipe manufacturing started in 1948 when a new plant was erected. Now two cupolas produce 300 tons of gray iron daily.

phur. Iron with the satisfactory chemical and physical properties is obtained from 100 per cent scrap charges.

In the pipe foundry, 6000 pieces of soil pipe ranging from 2 to 15 in. in diameter are manufactured daily. The pipe is cleaned inside and out by steel shot and each pipe is hydro-tested for pin holes and other defects.

Sand and string cores are used for five foot lengths of pipe and made on core making machines. Sand is conveyed into a hopper and a wet arbor is rotated. Sand falls on the arbor and builds up, a knife blade trims away the excess material. String is wrapped around the cores to give additional strength.

In 1955 the company acquired the plated plumbing brass line of Barnes Manufacturing Co., Mansfield, Ohio, and erected a new building. Carbon crucibles are used in melting both yellow and red brass with temperatures controlled by direct reading thermocouples. After being pulled from gas furnaces, the crucibles are slagged and used as pouring lades. Brass castings are cleaned, rough ground and then machined on automatic equipment. They are then polished, inspected and given a triple plating of copper, nickel and chrome. The CO_2 process is used in making cores for Western's brass products.

In the fittings and burner foundry cores are made for soil pipe fittings from green sand cores. Molding sand is used and applied on iron arbors for greater strength.

TRAINING FUTURE FOUNDRYMEN AT GRANITE CITY

Shop work and plant tours give students a practical background

Ralph E. Johnston /
East St. Louis Casting Co.
East St. Louis, Ill.

Interest in foundry practices has been stimulated not only at high school level but at universities by the AFS St. Louis Chapter.

The Chapter educational committee, headed by J. R. Bodine, Bodine, Pattern & Foundry Co., St. Louis, Mo. has given assistance to the Granite City Vocational High School, Granite City, Ill., Olin Technical High School, Alton, Ill., University School of Mines Student Chapter, Rolla, Mo. and the metallurgical department of Washington University, St. Louis, Mo.

Two year foundry courses are offered at each of the high schools. One instructor handles the program at each of the schools with the emphasis placed on shop work for a practical understanding of foundry techniques. About 30 students are enrolled in foundry courses at Granite City and a smaller number at Alton. Many of the graduates are employed by casting companies in the greater St. Louis area.

Frequent plant tours are made to keep in touch with the latest developments. Instructors are invited to attend regular chapter meetings and have participated regularly in assisting the chapter to further its educational program.

Pictures of the foundry courses at Granite City Vocational High School were provided by Ralph E. Johnston, East St. Louis Casting Co., East St. Louis, Ill., Chapter reporter and publicity chairman.

Actual work in patternmaking and other basic courses in one of best equipped shops in the state provides foundry fundamentals for boys.

Drawing pattern of souvenir paperweight, a popular item with Granite High students.

Exhaust corebox being made in high school pattern shop. Boys work on project basis during the two-year program.

Preparing 7-in. cupola made by high school students in various vocational classes.

Instructor R. E. Bailey and M. A. Wittevrongel, adult and educational director, discuss future activities.

Shifting Wire Rope Will Increase Its Life

Wire rope can get a new lease on life by shifting the rope periodically or reversing the position of the rope on the drum to distribute severe wear more evenly.

In hoisting, wire rope is usually subjected to the severest wear at two or three critical points. This causes premature wear and replacement of the rope even though the major portion is still serviceable, according to Wickwire Spencer Steel Division of the Colorado Fuel and Iron Corporation.

Critical wear points generally include the portion of rope in contact with the sheaves as the load is picked up and also that portion which winds on the drum as the load is accelerated. The section of the rope which contacts the drum flange and rises to the next layer on the drum in multiple layer winding is also subject to excessive wear and distortion.

Wearing of the rope in contact with the sheaves is due to the rope speed being increased during the pick-up period which may cause slippage. The acceleration also increases the tension in the rope, resulting in radial pressure between the rope and sheave and causing greater pressure and wear.

The most practical way to lengthen rope life is to transfer the severe wear. One plan is to buy a slightly longer rope than will be needed and then periodically cutting off predetermined lengths. This will place the portions subject to greatest wear in new positions and bring less-used sections into the more critical areas.

Another method of shifting the severely worn portions is to reverse the rope from the drum end to the load end.

If the point of severest wear is near the midpoint of the rope then reversing will produce no benefits, since the position of greatest wear would not change and the length of rope life would not increase.

No matter what method is used, the important step is to institute a procedure which will alleviate the points of greatest wear before the damage becomes too far advanced.

foundry trade news

American Brake Shoe Co. . . has integrated five of its foundries into a new Engineered Castings Division. The five Brake Shoe foundries integrated by the move are located at Medina and Rochester, N. Y.; at Mahwah, N. J.; South San Francisco, Cal.; and Melrose Park, Ill. Before the change, Brake Shoe had an Engineered Castings Division, but only two foundries were included in its organization.

Stemac, Inc. . . Denver, Colo., die casting firm has been purchased by C. A. Norgren Co., Englewood, Colo., manufacturer of pneumatic products. The plant will now operate under the name of Norgren-Stemac, Inc.

Lake Erie Foundry Co. . . is now operating in the plant of the former Washington-Fillmore Foundry Co. at 143 Fillmore Ave., Buffalo, N. Y. The Lake Erie Foundry Co. operated in Buffalo from its organization in 1907 until its plant was destroyed by fire in July 1955, and now continues in the new location.

Coquitlam Development Co. Ltd. . . is building a steel foundry on a 20 acre site at Port Coquitlam, B. C., about 20 miles from Vancouver. The operation is a subsidiary of Electric Steel Foundry Co., Portland, Ore. According to present plans, the mechanized foundry will be in production in late September. Initial capacity will be 150 tons of clean casting per month, although the ultimate capacity will be 1000 tons per month.

American Steel Foundries . . report higher sales for first quarter of fiscal 1957. Net sales in the three months ended December 31, 1956, were $28,662,369, compared with $27,153,989 in the same period a year ago. Company president C. C. Jarchow told shareholders that it appears the results for the second and third quarters will be better than the first quarter.

A. P. Green Fire Brick Co. . . Mexico, Missouri, firm has purchased the firm of Richard C. Remmey Son Co., Philadelphia. The Remmey Co. devotes most of its production to special refractories, high temperature bonding mortar, and high alumina refractories.

Caterpillar Tractor Co. . . will build three new facilities on a 1,100-acre site 12 miles north of Peoria, Ill. The new facilities will be a 500,000 sq ft industrial engine plant, and multi-building research center and a general offices building.

Central Foundry Division . . is planning a large, modern foundry to be erected near Sao Paulo, Brazil, during 1957. The plant will be operated by General Motors do Brasil.

Solar Aircraft Co. . . has installed specially designed and built tumbling machines at its Des Moines, Iowa, plant. The equipment is used in finishing jet engine parts.

Sloan Valve Co. . . Chicago organization operating a brass and bronze foundry has joined the American Foundrymen's Society.

Ward and Sullins, Inc. . . is the new name of Kimball's Mineral Supplies, Inc., Camden, Tenn., producer of foundry sand. The firm has recently improved and expanded its facilities. S. C. Ward is president of the company.

Olin Mathieson Chemical Corp. . . is now loading fused alkali in specially-designed pallet boxes for foundries that purchase the material in carload quantities. The new method is said to reduce car-unloading time by as much as 90 per cent.

National Lead Co. . . has consolidated the sales of metal and metal products of its Philadelphia branch into its New York-headquartered Atlantic branch.

Titanium Alloy Mfg. . . the Niagara Falls plant of National Lead Co.'s Titanium Alloy Mfg. Division will undergo a major expansion in 1957. A new building to accommodate expanded production facilities will be completed by July 1.

Mexico Refractories Co. . . has opened new offices in Edmonton, Alberta, and Winnipeg, Manitoba, to complete its plans for representation in all eastern and western Canada industrial areas.

Union Carbide and Carbon Corp. . . has announced a price reduction of five cents/lb for ethyl silicate 40 and ethyl silicate, condensed.

Ram Chemicals, Inc. . . Gardena, Calif., firm has been named western sales and service representative for Marblette Corp., epoxy resin manufacturer.

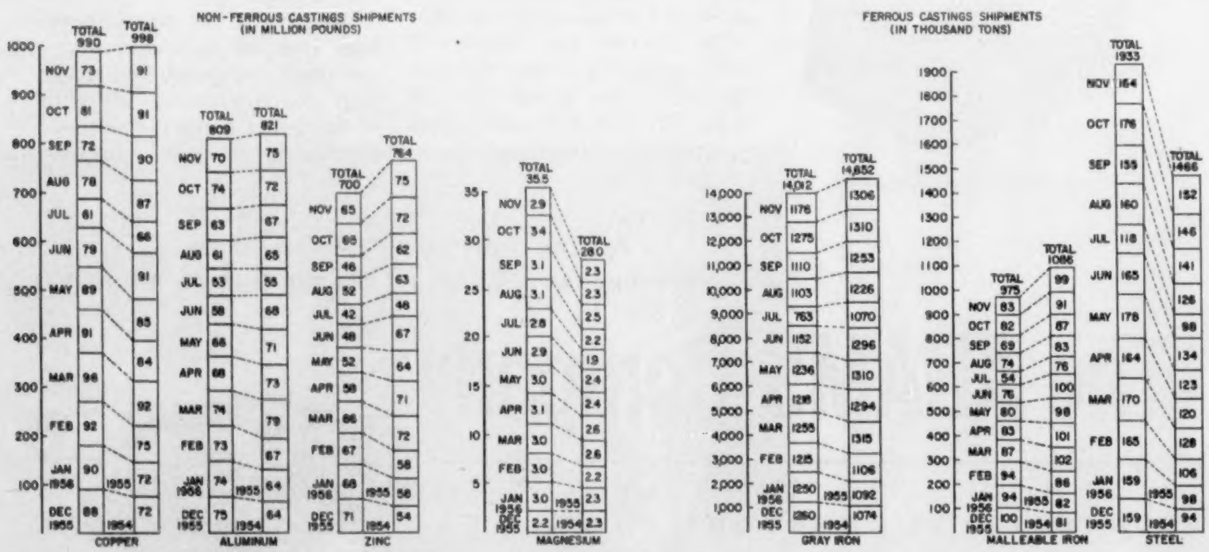
Conco Engineering Works . . has named Elbert Lively & Co., Inc., Newark, N. J., as distributor for its materials handling equipment in metropolitan New York and New Jersey.

Syracuse Metal Testing Lab . . has been established in Syracuse, N. Y., by R. E. Renders, to provide chemical analysis, physical testing and foundry consulting for ferrous and nonferrous foundries in the central New York area.

Allis-Chalmers . . expects to set a new record for sales volume in 1957. Company president R. S. Stevennson reports that the backlog of orders is 40 per cent higher than a year ago.

Black & Coulton, Inc. . . is the new name of the Cleveland materials handling equipment dealership which was formerly operated as H. F. Black Equipment Co.

how's business?



Tips on Casting Magnesium Outlined at Texas Chapter

Proper housekeeping will eliminate many of the fire hazards associated with sand casting magnesium, M. E. Brooks, Dow Chemical Co., Bay City, Mich., told members of the AFS Texas Chapter at the January meeting.

Brooks stated that magnesium and iron oxide scale will cause explosions at high temperatures which make it necessary to avoid accumulations of iron oxide in any part of the melting unit where magnesium might possibly make contact. In grinding operations, fires are likely to be started by ignition of magnesium dust or fines through sparks. The answer, said the speaker, was a good dust collector, preferably a wet type unit.

In discussing melting practices, Brooks emphasized the importance of a chloride flux to keep the metal from burning; stirring the flux helps remove the non-metallic elements from the molten metal.

Brooks pointed out that molding sands for magnesium should contain sulfur and boric acid which create the proper atmosphere in the mold during pouring. Sands are synthetic with a 50-70 AFS grain fineness to provide permeability.

The rate of flow in pouring is very important, the speaker stated. Molten metal must not squirt into the mold under pressure. Chaplet screens and steel wool are often used as a method of controlling the flow and cleaning the metal.

Magnesium's special properties of low heat conductivity and low weight offer special problems. Its low heat conductivity makes pouring long and thin castings difficult. Low density makes it hard to overcome back pressure during pouring.

Massive risers are required, Brooks pointed out, particularly in aircraft castings to guarantee sound castings. Often it is necessary to melt five times the metal actually needed.

At present there are 75 foundries in the United States making magnesium castings. Only two confine their work to non-military production. The balance are making both military and commercial castings or military only.

Military specifications call for alloys of magnesium containing rare earths. These require extreme care during melting and close heat treating practice to obtain the desired physical properties. Heat treating furnaces must have accurate atmospheric and temperature control. An additional problem arises from the castings being plastic at these heat treating temperatures so jigs are required to hold them in shape.

dietrich's corner

by h. f. dietrich

There is no doubt that the first workman made many false starts before he drew the first picture on a cave wall. He had to take time to learn to do the job he had in mind. His efforts were rewarded with a product that was better than the crude accomplishments of his fellows. The drawings could be understood by his less aesthetic neighbors.

If our cave man had a mercenary inclination, perhaps he would paint the cave wall of some of his neighbors—for a price. If his work was good, his services would be in demand. And so developed the individual workman whose craftsmanship was his livelihood.

In medieval times, a number of these craftsmen gathered together into guilds, supposititiously to improve the quality of their products. There is some doubt about the altruistic nature of their motives. Some belittling critics claim the real motive was to put the squeeze on individuals who did cut rate work.

To prove to the guild members that he was capable of producing work commensurate with their standards of quality, the graduating apprentice desirous of admission to the guild was required to produce a masterpiece which would pass the inspection of the judges. No doubt, there were occasions when political graft and dissention grew within the ranks—humans, being what they are, and the guilds being a little crowded—but, on the whole, a master craftsman took pride in his work. The hallmark replaced the name of the individual to insure quality of workmanship. The artisan was beginning to lose his individuality.

The guilds gradually gave way to the trades. The trades started as sort of a poor man's guild with standards set a little lower than the old school was willing to accept. The trades, as did the guilds, placed accent on time to learn. A molder could be a shoemaker as far as his ability was concerned; if he had spent the necessary years trying to learn the trade, he was given a card. The practice curtailed the activity of the window molder.

The tradesmen took pride in and placed a value on their ability. More than one old timer let his beer go flat at Mike Novac's, while he gazed intently at the cup, saucer, and spoon cast as a single unit in green sand. Conferences were held to decide where partings should be cut, and where cheeks and drawbacks should be used. The following noon, some enterprising soul would be sure to bring his wife's crockery, and go to work on a rolling cheek. It was the masterpiece idea with the world as judge. The product—if successfully cast—would be displayed for the world to see. Now these relics have gone the way of creaseless pants, ruffled collars, and mustache cups.

The trades have been replaced by an age of specialization. We have developed such classifications as "Lower-water-jacket-core-setter" and "Exhaust - manifold - wire - puller." It would require a special psychological makeup—and a certain I.Q. rating—to take pride in one's ability to pull manifold wires.

A molder—it says so on his card—learns to open a hopper gate, count the number of jolts, press a lever until a pop-off valve opens, jerk things apart, and set the hump of sand on a conveyor. We have shortened the time of learning to a minimum.

Now, the personnel department gives a test to determine whether a man can keep his fingers out of the machinery; the foreman explains each operation of a job to the new employee; the patterns are as fool-proof as it is humanly possible to make them, and the equipment is engineered to the job.

If the only requirement necessary to claim knowledge of an occupation is the ability to keep one's fingers out of the machinery; if we have shortened the time to learn to zero; if we have developed our technological controls to the point of lever pushing production; perhaps we are correct in believing that the day will come when we will receive our checks by mail without the drudgery of going after them. The trend seems to be in that direction.

I will welcome the innovation because I am a beach-comber at heart. But, I do note with interest, the passing of the colorful character, The Vanishing Craftsman.

Chicago Will Be Site of S.F.S.A. Annual Meeting

Steel Founders' Society of America members will be addressed by speakers from outside the society as well as division chairmen at the 55th annual meeting to be held March 18-19 at the Drake Hotel, Chicago.

Featured speakers will be Herman Stuetzer, Lybrand, Ross Bros. and Montgomery, Boston, Mass., on *"Depreciation for Tax Purposes;"* J. Lewis Powell, office of the assistant secretary of Defense, who will discuss *"The Production Allocations Plan;"* and Dr. Murray Banks, New York psychologist, whose subject will be *"What to Do Until the Psychologist Comes."*

Willard P. Dudley, Ohio Steel Foundry Co., Lima, Ohio, will discuss safety activities from the executive viewpoint and A. J. McDonald, Washington representative of S.F.S.A. will report on current Washington activities as related to the steel castings industry.

Chairmen of the society's major committees will also report. These include: Henry D. Phillips, technical research committee, Adirondack Foundries & Steel Inc., Watervliet, N. Y.; Marion J. Allen, advertising and public relations committee, American Steel Foundries, Chicago; I. M. Emery, technical and operating committee, Massillon Steel Casting Co., Massillon, Ohio; Roy A. Gezelius, product and market development committee, General Steel Castings Corp., Eddystone, Pa.; and Claude L. Harrell, program appraisal committee, Sterling Steel Casting Co., East St. Louis, Ill.

The Lorenz memorial medal and the technical and operating medal will be awarded as well as certificates for outstanding service to the industry.

Howard F. Park, Jr., S.F.S.A. president and vice-president General Steel Castings Corp., Granite City, Ill., will be the presiding officer.

So-o-o! that's where the flour is going.

for the asking

Sandslinger bulletin 320, 36 pp, covers the stationary "Sandslinger" "Hydra - Slinger" and "Speedslinger." Included are basic principles, adaptability, application and specifications. *Bearsley & Piper Div., Pettibone Mulliken Corp.*

CIRCLE NO. 61, PAGE 7-8

Roller chain shear pin sprocket catalog 2749, 4 pp, gives information and tables listing stock sizes, torque ratings, hub dimensions and keyseats. *Link-Belt Co.*

CIRCLE NO. 62, PAGE 7-8

Sand conditioning oil, also sand release agent are covered in 4 pp brochure. Oil aids in eliminating sand sticking problems in plastic resin core sand mixes. Release agent claimed to increase sand flowability and workbility. *Delta Oil Products Co.*

CIRCLE NO. 63, PAGE 7-8

Steel grit abrasives brochure discusses finishes on non-ferrous metals. Illustrated with case histories. *Wheelabrator Corp.*

CIRCLE NO. 64, PAGE 7-8

Muller and related equipment manual, 10 pp, explains unloading, installation and set-up; plow settings; muller adjustment and lubrication. Also covers aerators, bucket loaders and auxiliary equipment. *National Engineering Co.*

CIRCLE NO. 65, PAGE 7-8

Laboratory equipment catalog, 16 pp, has pH meters, ovens, hydraulic press and timer for automatically shutting off lab appliances. *Schaar & Co.*

CIRCLE NO. 66, PAGE 7-8

Strainer core catalog, 24 pp, covers cores made from high strength refractory material and other ceramic items. *Saxonburg Ceramics.*

CIRCLE NO. 67, PAGE 7-8

Arc welding machine and accessory catalog 1340, 44 pp, includes these types: selenium rectifier DC, motor generator DC, engine driven DC, AC/DC, AC transformer, engine driven AC and optional equipment. *Air Reduction Co.*

CIRCLE NO. 68, PAGE 7-8

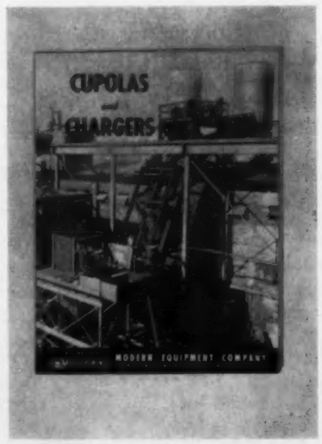
Tractor shovel catalog 304, 8 pp, shows machinery in action in foundries and other industries. Unit features roll-back action. *Frank G. Hough Co.*

CIRCLE NO. 69, PAGE 7-8

Stainless steel types "308, 309 and 310" are highlighted in 8 pp booklet with physical properties, heat treatment, elevated temperature strength, fatigue strength and oxidation resistance. Steels used in furnace parts, boiler baffles, fire box sheets, oven linings etc. *Allegheny Ludlum Steel Corp.*

CIRCLE NO. 70, PAGE 7-8

Cupola and charging equipment catalog, 36 pp, contains 84 photos and line drawings to illustrate principles



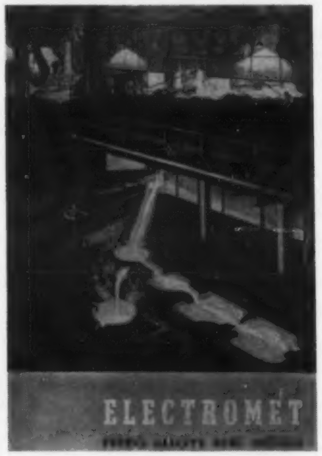
and applications, eight pp. Explains automatic cupola charging. *Modern Equipment Co.*

CIRCLE NO. 71, PAGE 7-8

Pneumatic and hand chisel catalog, 16 pp, lists chisels by point style, body size and shank type. Charts list

parts numbers for each size and style of chisels. *Bedford Tool & Forge Co.*
CIRCLE NO. 72, PAGE 7-8

Ferro-alloys and metals, 104 pp, contains history, properties and uses for boron, calcium, chromium, columbium, manganese, silicon, titanium,



tungsten, vanadium, zirconium and their alloys. *Electro Metallurgical Co. Div., Union Carbide & Carbon Corp.*
CIRCLE NO. 73, PAGE 7-8

Industrial sand brochure outlines processes and facilities used in producing sands for foundries. Twenty-four grades listed with chemical analysis. *Wedron Silica Co.*
CIRCLE NO. 74, PAGE 7-8

Barrel finishing equipment and supply catalog, 20 pp, includes information on different types of abrasive and burnishing media. Includes before and after photographs. *Globe Div., Casalbi Co.*
CIRCLE NO. 75, PAGE 7-8

Shell molding brochure, 38 pp, discusses the process including techniques in making patterns, draft, gates and risers, ejection, ovens, mixing equipment, sand, resins, and other data for best results with method. *Durez Plastics & Chemicals, Inc.*
CIRCLE NO. 76, PAGE 7-8

Sweep brush catalog, 4 pp, explains use of synthetic fill which can be easily cleaned, will not break off and resists petroleum solvents. *Osborn Mfg. Co.*
CIRCLE NO. 77, PAGE 7-8

Machine tool catalog 5700, 80 pp, includes engine lathes, toolroom lathes, turret lathes, vertical spindle milling machines, bench shapers, drill presses and pedestal tool grinders. Also shown are capacities and space requirements. *South Bend Lathe Works.*
CIRCLE NO. 78, PAGE 7-8

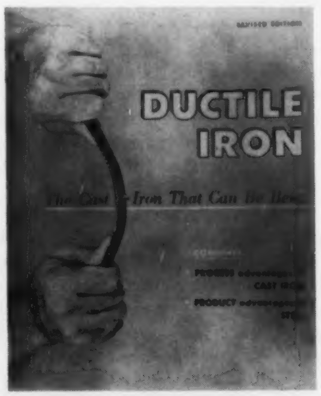
Shell molding process bulletin 1005, 38 pp, contains historical background, synopsis of the process, equipment requirements, material requirements, practical considerations of the process and limitations. *Monsanto Chemical Co.*
CIRCLE NO. 79, PAGE 7-8

Brass, bronze and nickel silver casting alloy wall chart details 37 standard alloys, their Navy, S.A.E., A.S.T.M. and federal specification designations and chemical composition by percentages of ingredient metals. *Henning Bros. & Smith.*
CIRCLE NO. 80, PAGE 7-8

Strain gage catalog, 16 pp, covers the SR-4 line. In addition to new flat grid gages, the booklet contains a discussion of gages and methods of using them. *Electronics & Instrumentation Div., Baldwin-Lima-Hamilton Corp.*
CIRCLE NO. 81, PAGE 7-8

Iron-powder electrode brochure gives performance factors and A.W.S. specifications. *Hoeganaes Sponge Iron Corp.*
CIRCLE NO. 82, PAGE 7-8

Ductile iron catalog, 30 pp, covers castability, tensile and yield strengths, relationship between tensile properties and hardness, other mechanical properties, heat treatment, typical



applications economies of the metal. Ilustrations show product applications. *International Nickel Co., Inc.*
CIRCLE NO. 83, PAGE 7-8

Compressor catalog, automotive and industrial, 20 pp, covers line from 1/3 to 20 hp. Specifications given on single and two-stage models, portable

types, tanks, pumps and accessories. *Kellogg Div., American Brake Shoe Co.*

CIRCLE NO. 84, PAGE 7-8

Abrasive wheel data book, 36 pp, lists rubber and resinoid bonded grinding wheels by industry. Separate pages for cut-off, depressed-center, centerless grinding and regulating wheels. *Manhattan Rubber Div., Raybestos-Manhattan, Inc.*

CIRCLE NO. 85, PAGE 7-8

Electrical smoke precipitator, "Smokatron" 6 pp, explains principles with diagrams and pictures of equipment in operation. Operates on standard 3-phase 60 cycle current. *Sumner & Co.*

CIRCLE NO. 86, PAGE 7-8

Aluminum alloy designations converted from old to new are contained in chart form. Also included are six charts on selection of alloys and fluxes to weld, braze and solder aluminum. *All-State Welding Alloys Co., Inc.*

CIRCLE NO. 87, PAGE 7-8

Thermopiles for converting infra-red energy into electrical energy suitable for amplification and measurement are covered in 12 pp booklet. Said available for first time in this country. *Jarrell-Ash Co.*

CIRCLE NO. 88, PAGE 7-8

Vacuum forming using gypsum cements shows procedures, 12 pp. Several techniques covered for making molds and forms for vacuum forming plastic sheet materials. *United States Gypsum Co.*

CIRCLE NO. 89, PAGE 7-8

Air conditioning brochure contains reviews and forecasts for the air conditioning industry, master plan formula for conditioning large buildings and trends in conditioning. *Trane Co.*

CIRCLE NO. 90, PAGE 7-8

Refractory products bulletin lists brand names, typical applications and special services. Includes information on all classes of fire clay brick plus "70 per cent alumina brick." *Ironton Fire Brick Co.*

CIRCLE NO. 91, PAGE 7-8

Pyrometer catalog No. 1040, 8 pp, covers instruments for measuring temperature, and air velocity and dew point. *Illinois Testing Laboratories, Inc.*

CIRCLE NO. 92, PAGE 7-8

Alloy chain and sling wall chart has table giving work load for single, double, triple and quadruple branch slings. Also lists definitions, instructions and cautions. *S. G. Taylor Chain Co., Inc.*

CIRCLE NO. 93, PAGE 7-8

Drill press catalog, 4 pp, describes 15 in. line. Listed are specifications for 40 different models including bench or floor model, high or slow speed, Morse taper or key chuck spindle, single or multiple spindles and standard or production table models. *Delta Power Tool Div., Rockwell Mfg. Co.*

CIRCLE NO. 94, PAGE 7-8

Granular basic furnace refractories booklet, 12 pp, discusses history, development and current gunning procedure in foundry, steel and copper industry furnaces. *Basic Refractories, Inc.*

CIRCLE NO. 95, PAGE 7-8

Air tool catalog 53, 84 pp, describes 40 basic tools with model variations, accessories and adaptors. Stresses interchangeability of parts for many tools. *Thor Power Tool Co.*

CIRCLE NO. 96, PAGE 7-8

Industrial insulating materials catalog, 20 pp, lists standard sizes, thicknesses, thermal conductivities for more than 20 types of heat and cold insulations for equipment and piping, also includes temperature-thickness recommendations for each. *Baldwin-Hill Co.*

CIRCLE NO. 97, PAGE 7-8

Jackets, foundry, cast iron or aluminum, covered in product sheet. All sections vertically grooved on inside, horizontally grooved and ribbed outside. *The Adams Co.*

CIRCLE NO. 98, PAGE 7-8

Engineering services from independent laboratories are discussed in folder outlining advantages and how, why and when to select one. *Eastern Div., American Council of Independent Laboratories.*

CIRCLE NO. 99, PAGE 7-8

Industrial lighting unit specifications book contains revisions in both incandescent and fluorescent units as well as new lighting data. Most important changes are new coefficient of utilization tables for eight different incandescent and flourescent units. *RLM Standards Institute.*

CIRCLE NO. 100, PAGE 7-8

Bentonite, how it is obtained and processing steps involved is explained in 4 pp reprint. *Magnet Cove Barium Corp.*

CIRCLE NO. 101, PAGE 7-8

new books

Conference on Materials and Design for Low-Temperature Service . . PB 121009. 419 pp. Engineer Research and Development Laboratories, Ft. Belvoir, Virginia, sponsored by the Scientific Council, Engineer Research and Development Laboratories . . . order from Office of Technical Services, U.S. Dept. of Commerce, Washington 25, D.C. 1952. $10.

Contents include: History of low-temperature property evaluation tests; Fundamentals of fracture in metallic materials; Some metallurgical aspects of low-temperature behavior of metals; Low-temperature properties of ferritic alloys; Effect of chemical composition on transition temperatures; Military experience in low-temperature failure of metals; Subzero applications of steel at high hardness levels; The evaluation of ship-plate steel by the navy tear test; Performance evaluation of structural steels and weldments; Brittle fractures in ship plates; Low-temperature structural failures versus design; reproducibility of charpy impact test; Use of impact tests in steel specifications; Design criteria for low-temperature applications; Discussion of "design criteria for low-temperature applications; Low-temperature properties and applications of aluminum, magnesium, heavy non-ferrous metals and alloys, and austenitic-cast alloys; Preliminary survey of the low-temperature properties of titanium; Wrought austenitic steels for low-temperature service; Limitations of present knowledge of low-temperature properties; Low-temperature metallic materials of the future; Low-temperature welded design of the future; Low-temperature studies which should be sponsored by the government or private industry; Current sources of information on low-temperature properties. Photos, references, drawings, diagrams, graphs, and tables.

The Running and Gating of Sand Castings—A Review of the Literature . . R. W. Ruddle. 183 pp. The Institute of Metals, 4 Grosvenor Gardens, London, S.W.1, England. 1956. $2.20 to members, $3.35 to non-members.

Results of research on the flow of metal in commonly-used gating systems, and of the fundamental principles involved in gating, made with the object of placing the design of gating systems on a scientific basis. 121 references.

Casting Kaiser Aluminum . . 376 pp. Office of Technical Editor, Kaiser Aluminum & Chemical Sales, Inc., 919 N. Michigan Blvd., Chicago 11. 1956. Copies complimentary if requested on company letterhead, otherwise $5.

All phases of aluminum casting including, general castability, and characteristics, casting processes, furnaces for melting, chemical and physical charac-

teristics of molten Al, casting design, sand, permanent mold, die, shell mold, plaster mold, investment, and centrifugal casting, heat treatment of and surface measurement and finishes for Al castings, inspection methods and supplementary operations. Glossary.

Oxygen in Iron and Steel Making . . J. B. Charles, W. J. B. Chater, J. L. Harrison, 309 pp. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N.Y. 1956. $6.50.

A critical review of the published information and the results of trials previously unreported. Its purpose is to enable a clear and rapid assessment of the various oxygen applications to be made.

Effect of Geometry on the Properties of 195-T6 and 356-T6 Aluminum Alloy Castings . . W. H. Johnson and H. F. Bishop (U.S. Naval Research Laboratory) 16 p. Office of Technical Services, U.S. Department of Commerce, Washington 25. 1956. 50¢.

Tensile properties were determined at various locations in cast aluminum alloy castings of different thicknesses and geometries and compared with properties obtained from separately cast test bars. The properties of the 195 alloy castings were shown to be more sensitive to cooling rates than those of the 356 alloy. The properties of the 195 alloy castings are also affected to a greater extent by section thickness variations than for the case of 356 alloy castings. It is shown that special molding and melting processes may be used to develop properties in castings which approach (alloy 356) or exceed (alloy 195) test bar properties. NRL R 4761.

Handbook of Material Trade Names, Supplement 1 . . O. T. Zimmerman and Irvin Lavine. 378 p. Industrial Research Service, Inc., Masonic Building, Dover, N.H. 1956. $12.50; $13.50 outside U.S.A.

This supplement brings the 1953 edition of the Handbook up-to-date. It is divided into three sections: an alphabetical listing of trade names (which gives the physical and chemical properties, important industrial uses, and the name of the manufacturer or distributor of the material); a use classification (in which all materials listed in section 1 are cross-indexed according to use and composition); and a company directory (which lists all companies whose products are described in the book.)

Symposium on Powder Metallurgy 1954 . . 390 p. The Iron and Steel Institute, 4 Grosvenor Gardens, London, S.W.1, England. 1956.

Largely devoted to developments in powder metallurgy in England from 1947 to 1954, this book is divided into four sections: 1. the manufacture, properties, and testing of powders; 2. the principles and control of compacting and sintering; 3. the manufacture and properties of structural engineering components; and 4. the powder metallurgy of high-melting-point materials.

Nancy Eddy, *Librarian*
American Foundrymen's Society

patent review

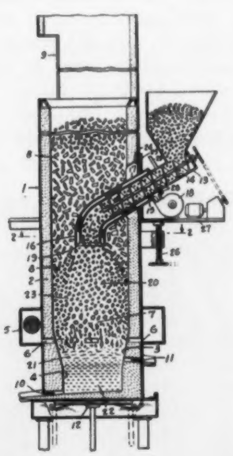
MELVIN NORD, *Dr. Eng. Sci., LL. B*
Consultant in Law and Engineering

Water Bath for Molds

Rapid melting away of pattern wax from an unsupported dip-coated investment mold is the purpose of a newly patented process. In the process a wax pattern is dipped in a slurry and the coating allowed to solidify. The dip-coated mold with the wax pattern is then immersed in water at the boiling point for about a minute. The mold is then placed in an oven at 200 F or higher to melt out the wax. The initial water bath is said to melt the wax next to the mold surface so that the expansion of the remaining wax as it melts does not exert destructive pressures against the unsupported mold. 2,759,232, *issued August* 21, 1956, *to G. Demeter, J. C. Johnson, and F. X. Maher, Jr., and assigned to Arwood Precision Castings Corp.*

Cupola for Coke Economy

Fuel savings are promised by a cupola that charges coke independently of the metal. A screw conveyor operating in a jacketed tube feeds the coke. Air for combustion is supplied through the tube jacket. By feeding coke below the top of the cupola, loss of volatile combustible constituents of the coke is avoided. 2,760,771, *issued August* 28, 1956, *to Walter J. Knappe.*



Coke feed promises economy.

Titanium for Eutectic

A highly refined eutectic graphite structure results in castings made with iron containing more than 0.2 per cent titanium. In this process a molten slag containing at least 1.0 per cent titanium in the form of titanium dioxide is caused to contact the molten iron. 2,759,812, *issued August* 21, 1956, *to Hiroshi Sawamura.*

Carburizing Iron

If large amounts of low-carbon scrap are to be melted in the cupola, the foundry may want to use a newly patented process to inoculate the iron with carbon. In this process, finely divided granules of electric furnace graphite are carried into the iron by a very small volume of a carrier gas. If the volume of gas is more than 2 cu ft/lb of graphite, the gas tends to sweep the graphite through the metal instead of bringing it into contact with the metal. Gas may be air, nitrogen, propane, natural gas, etc. 2,762,701, *issued September* 11, 1956, *to F. T. Crego and P. M. Hlume, and assigned to Air Reduction Co.*

Non-Stick Foundry Sand

A shell molding sand that will not stick to the pattern equipment has been patented. Sand contains a synthetic resin adhesive, addition agents, and a high molecular weight halogenated organic compound which prevents sand particles from sticking to pattern equipment. Preferred anti-sticking component is lauryl bromide. 2,763,626, *issued September* 18, 1956, *to H. K. Salzberg, and assigned to The Borden Co.*

Other Patents

Machine for producing iron castings by closing male die on female die containing molten metal. 2,758,346, *Walter Macfarlane & Co. Ltd.*

Control mechanism for core blowers. 2,759,229, *Pettibone Mulliken Corp.*

Casting metals in anodized aluminum molds. 2,759,231, *Conrad A. Parlanti.*

Device for the discharge of molten metal. 2,755,327, Ajax Engineering Corp.

Apparatus for making molds. 2,755,526, Polygram Casting Co., Ltd.

Mold-supporting means for shell molding. 2,756,473, International Harvester Co.

Transfer device for conveying molten metal. 2,756,988, Ajax Engineering Corp.

Production of magnesium-containing iron. 2,757,082, International Nickel Co., Inc.

Additive for foundry sand. 2,756,095, Walter Gerlinger, Inc.

Core making apparatus. 2,757,424, U. S. Pipe and Foundry Co.

Mold box. 2,757,431, Roger F. Williams.

Process for renewing permanent molds by removing a uniform increment of the mold material from the surfaces of the mold cavity. 2,761,201, *Griffin Wheel Co.*

Cupola gas conditioning apparatus. 2,761,671, *American Radiator & Standard Sanitary Corp.*

Gray iron cylinder sleeve. 2,761,801, *Thompson Products, Inc.*

Turntable type machine for forming shell molds. 2,762,092, *Mechanical Handling Systems, Inc.*

Automatic machine for casting battery post connecting straps. 2,762,094, *Price Battery Corp.*

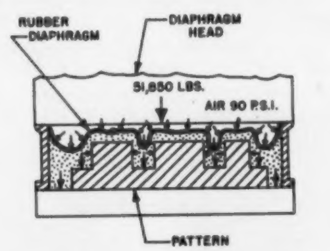
questions and answers

Misery loves company so why not share your castings problems with us? MODERN CASTINGS invites you to "stump the experts" with tales of gremlins that are haunting your scrap piles. And if any of you readers have better answers to the questions below, don't be a hesitator, write the editor.

high-pressure

What is high-pressure molding?

High-pressure molding has recently assumed a position of importance as a production molding technique. Its success can be attributed to improved sand technology and new equipment which uses air pressure exerted against a rubber diaphragm as shown in the accompanying diagram. The diaphragm follows approximately the



shape of the pattern being molded so as to form a green sand shell mold. The uniform distribution of the air pressure squeezes the sand sufficiently to attain an unusually high degree of accuracy, smoothness, and green strength. Some work has also been done with the use of sodium silicate bonded sands to make the green sand shell followed by CO_2 gassing.

Advantages of high-pressure molding, also called "diaphragm molding," are (1) more uniform mold hardness, (2) increased hardness on vertical surfaces of mold, (3) very short molding cycle, (4) no foundations required for equipment, (5) reduced equipment maintenance, and (6) reduced noise. On the negative side of the ledger one must realize that (1) stronger flasks are required, (2) deeper flasks may be needed, (3) mold hardness in deep pockets may not be improved, (4) production rate still depends on flask handling, (5) the life of the diaphragm is limited.

CO_2 and cement

Have you heard that CO_2 is being used in Europe to harden cement-bonded sand molds?

Considerable work has been done on this process at the Werkspoor N. V. in Utrecht, Holland. Tests showed that cement bonded sand hardens relatively fast if treated with CO_2. After 5-minute's treatment sand cores had attained sufficient strength to be removed from cores boxes and transported. To obtain the final required strength the cores must stand for a period of time as in normal practice. This process is described in detail in the magazine *Metalen*, Aug. 15 and 31, 1956. A translation of this article is scheduled to appear in an early issue of MODERN CASTINGS.

to stop corrosion

We are having corrosion troubles with cast parts made from aluminum alloy 108 and used in agriculture spraying equipment. What alloy would give us similar physical properties but better corrosion resistance?

We suggest you switch to alloy 43 which contains 5 per cent silicon and has excellent corrosion resistance. This alloy will be easier to cast than 108, makes good pressure-tight castings, has an ultimate strength about equal, but a yield of only 8,000 psi as compared with 14,000 psi for alloy 108. Machinability will be improved by using tungsten carbide cutting tools.

treating skillets

How should we treat a cast iron cooking utensil so it will not rust and food will not stick to it?

This treatment, commonly referred to as "preseasoning," may be accomplished by rubbing the inside of the utensil with unsalted fat such as lard, suet, vegetable shortening, or vegetable oil. Rub off the excess and heat the utensil for several hours at low enough temperature to avoid smoking or burning. Wipe clean, let utensil cool and repeat this operation a second time. This treatment seals off the porous surface of the utensil with a film of oxidized fat that prevents food sticking. Reports have been received of excellent results obtained by using silicone oils to treat cooking utensils as a means of preventing sticking.

obituaries

Harry E. Ladwig, 61, retired official of Allis-Chalmers Manufacturing Co., died January 21. He started with the firm at the age of 14, as a messenger, and rose to works manager of the West Allis Works foundries and pattern shops. Since his retirement in January, 1955, he had been a consultant for the company.

H. E. Ladwig

Mr. Ladwig was a past president of the Wisconsin Chapter of AFS, and past president of the National Foundry Association.

Charles C. Kawin, 79, founder and chairman of the board of Charles C. Kawin Co., Chicago, died January 26. He was one of the pioneers in organizing and developing the use of chemical analysis as a control procedure in ferrous and non-ferrous foundry fields. During World War I he operated five laboratories in different parts of the United States and Canada, organizing an engineering division which built a large number of foundries throughout the country.

C. C. Kawin

Mr. Kawin was a long-time member of AFS, serving as treasurer of

the Chicago Chapter for many years. He also belonged to the Chicago Chemist Club and had been a member of the American Chemical Society since 1902. He was very active in civic affairs and took a keen interest in the training and developing of young men in the foundry industry.

William B. Straub, former president of Empire Foundry Co., Oakland and also of Straub Mfg. Co., died November 17, 1956 in Piedmont, Calif.

Francis T. Hartman, 50, foundry superintendent for The American Malleable Castings Co., Marion, Ohio, died January 10 in the Cleveland Clinic Hospital. He had been with the company 24 years.

Mr. Hartman was a member of the Central Ohio Chapter of AFS and was a director of that Chapter 1951-54.

Charles A. McCormack, 77, general material supervisor at Allis-Chalmers Manufacturing Co., Milwaukee, died January 20. He started with the company in 1895 at the age of 15, as timekeeper. He had been in retirement since December, 1950.

Ray L. Howard, sales engineer for Dana Corporation, Toledo, Ohio, died January 29 at the age of 61, of a heart attack.

Mr. Howard was active in aviation and automobile racing, placing in the first 10 in 1920 at Indianapolis Speedway, prior to becoming a clutch specialist in the automotive industry.

casting through the ages

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local foundry news

Saginaw Valley Keeps Local Interest High by Featuring Speakers from Area

Chapter Members describe operations in own plants

A keen interest in local foundry problems is one of the fundamental purposes of AFS local chapters. By this, problems and technological advances are shared with other members and a feeling of fellowship developed.

The Saginaw Valley Chapter maintains this interest by annually inviting members to describe operations in their foundries. In December, five members participated in discussions of local casting activities.

R. P. Strieter of the magnesium department of Dow Chemical Co., Midland, Mich., described hot and cold chamber methods of producing magnesium die castings weighing from ½-oz to 16-lb. Both commercial and military castings are manufactured with the average piece weighing ¼-oz.

Roy W. Foster, Bay City Foundry Co., Bay City, Mich. traced the development of the Bay City operations and the trend toward specialization. This, he said, has required greater emphasis on foundry techniques.

John Stout, Buick Motor Div., General Motors Corp., Flint, Mich., told of the development of the Flint foundry, started in 1915. Since 1927 when a new foundry was built the modernization has been continuous. Stout said that the foundry now employs 2400. Production is chiefly in sand casting but centrifugal and shell castings are also made. The Flint foundry has six 108-in. cupolas. Molding is done in nine bays, two housing automatic indexing molding machines. Most cores are produced in 23 five-station core blowers and nine two-station blowers for block cores.

Operations at the Genesee Foundry & Pattern Co., Flint, Mich., were explained by Ray Klawuhn. Genesee makes patterns and operates a small jobbing foundry producing aluminum, bronze, brass, copper and gray iron castings. Most castings are made from loose patterns. The plant has a daily capacity of 16,000-lb aluminum and 8,000-lb brass, bronze or copper. The gray iron capacity is 3½-tons per hour.

Howard McClelland, Eaton Mfg. Co., Vassar, Mich., outlined the foundry's history which started in 1923. It has been a division of Eaton Mfg. Co. since 1937. Since 1947 it has produced permanent mold castings exclusively in one analysis of cast iron. At present, 1200 different castings are made. With approximately 500 employees, the foundry produces about 50,000 castings yearly. These range from less than 1-lb to 25-lb, the average being 1½-lb. Melting is done in three No. 9 cupolas, all castings are annealed.

Cincinnati Discusses Cupolas

Design and operation of the water-cooled cupola were discussed at the November meeting of the **Cincinnati Chapter.** Tom W. Curry, Lynchburg Foundry Co., Lynchburg, Tenn. was the speaker and used slides to show the improvements at Lynchburg with these cupolas.

AFS Wins 1100 Members in Year

Membership for the American Foundrymen's Society on January 31 was 13,301. This is 1100 more than one year ago. Outstanding among the society's 46 chapters is Eastern Canada which in seven months increased its membership from 325 to 365. The three largest chapters are: Chicago, 906; Northeastern Ohio, 765 and Wisconsin, 632.

Saginaw Valley Chapter members at the December meeting heard five members discuss operations of area foundries. Speakers left to right are: F. P. Streiter, Dow Chemical Co., Midland, Mich.; Howard McCelland, Eaton Mfg. Co., Vassar, Mich.; Ray Klawuhn, Genesee Foundry & Pattern Co., Flint, Mich.; John Stout, Buick Motor Div., GMC, Flint, Mich.; Roy Foster, Bay City Foundry Co., Bay City, Mich.

Central Illinois Chapter's January meeting was attended by 140. Featured speaker was Charles E. Drury, plant manager, Central Foundry Div., GMC, Danville, Ill. He spoke on *"Gating to Control Pouring Rate and Its Effect on the Casting."* Looking at a slide used during the illustrated talk are left to right: Frank W. Shipley, AFS President; speaker Drury; Clarence Turner, technical chairman, Caterpillar Tractor Co., Peoria, Ill.; L. D. Harkrider, General Malleable Corp., Waukesha, Wis.

Management night was featured at the January meeting of the **Birmingham Chapter.** Guest speaker was James H. Smith, general manager, Central Foundry Div., GMC, who spoke on *"The Future of the Foundry Industry in America."* Shown in photo left to right are Sam Carter, chapter vice-chairman; N. W. Debardeleben, Debardeleben Coal Corp.; J. H. Smith; John Drenning, Kerchner Marshall & Co., chapter chairman; and Ed Walsh, executive secretary, Foundry Educational Foundation.

Cincinnati Holds Annual Dance

Cincinnati's Chapter of the American Foundrymen's Society held its 18th annual dinner dance in December at the Netherland-Hilton Hotel. More than 500 members and guests attended.

Utah was officially installed as the 46th chapter of the American Foundrymen's Society, January 21. The chapter's 101 members made it the largest group to be admitted to the society in 10 years. National officers attending were AFS Preisdent Frank W. Shipley and General Manager Wm. W. Maloney. Guest speaker was D. N. Rosenblatt, American Foundry & Machine Co., Salt Lake City, Utah, who discussed technology and the foundries. Shown in photo are left, AFS General Manager Wm. W. Maloney who is presenting the "cast iron rattle" to Utah Chapter President Arthur S. Klopf.

Chicago Chapter President, Robert P. Schauss, Werner G. Smith, Inc., Chicago, center, presents $1000 check to Daniel MacMaster, director of the Chicago Museum of Science and Industry. On the left is H. M. Krueger, American Brake Shoe Co. The check is a contribution toward maintaining the foundry exhibit at the museum.

A casting symposium held in January by the **Philadelphia Chapter** was attended by 155. B. A. Miller, Crown Non-Ferrous Foundry, center of photo was the moderator. Panel members, left to right are: non-ferrous, Fred J. Donkerley, Rolle, Mfg. Co.; sand, Clyde A. Sanders, American Colloid Co., also the evening speaker; gray iron, C. W. Mooney, Jr., Link-Belt Co.; and steel, E. Berry, Dodge Steel Co.

Eastern Canada Chapter Hears Talk on Defects

Eastern Canada Chapter members at their December meeting were cautioned to make a thorough study of their present equipment and techniques before adopting new casting processes. This advice was given by Clyde A. Sanders, American Colloid Co., the main speaker.

Sanders demonstrated the finish and accuracy obtainable with green sand molding and stated that these compared favorably with results obtainable from shell molding, and at lower cost. He stated that the main requirement for these finishes is fine sand. Sanders pointed out that surface finish should not be confused with size tolerance. He said that there is a definite limit to size tolerance that can be produced by any casting method and this is not necessarily related to the surface finish. He added that the size tolerance obtainable should always be stated in terms of inches per inch and not simply plus or minus a certain amount.

Synthetic sands were discussed at the January meeting of the **Northeastern Ohio Chapter.** Charles Schureman, foundry sand consultant, Green Valley, Ill., was the featured speaker. He stated that too little attention is paid to a systematic and thorough sand program. He emphasized that a skilled sand mill operator is essential to the success of the plan. Schureman, shown at left, talks to Hugh Stoller, Stoller Chemical Co., Akron, Ohio; and Claude Jeter, Ford Motor Co., chapter vice-chairman.

Continued on page 80

Continued from page 79

Quality control and its application to foundries was explained to members of the **St. Louis Chapter** at its December meeting. Edward Oakley, Delco-Remy Div., General Motors Corp. stated that most foundries have the available information needed to establish quality control methods. It is merely a matter of applying and interpreting this information, he pointed out. His discussion of the laws of probability were illustrated through the use of charts and a frequency distribution demonstrator.

Turbulence and its relation to gating design was covered at the January meeting of the **St. Louis Chapter.** John G. Kura, Battelle Memorial Institute, Columbus, Ohio, showed a new Battelle film,"***A Story of Vertical Gating Design.***" Flow through the gating system was observed in transparent plastic molds. Kura is shown at left, at right is A. F. O'Hare, O'Hare's Foundry Co., St. Louis, chapter director.

Washington Chapter Hears Bock

An illustrated lecture on *"Insulating and Exothermic Material—Aids to Better Feeding"* was presented at the January meeting of the Washington Chapter by Michael Bock II, Exomet, Inc. Bock analyzed the solidification of metal and the effects of insulating and exothermic materials. He stated that solidification is a problem in heat loss; the heat loss from the top of the riser is radiation while the loss from the side of the riser is a conduction loss. He demonstrated that as riser diameters increase the radiation loss increases. Slides illustrated many uses for exothermic compounds.

Exothermics were discussed at the January meeting of the **Tri-State Chapter.** The evening speaker was Don Wyman, former Tulsa resident and now sales manager, Exomet, Inc., Conneaut, Ohio. Shown in picture left to right are: Chapter Chairman Bud Forsyth, Big Four Foundry Co., Inc., Tulsa; speaker Don Wyman; Chapter Vice-Chairman Ed O'Brien, Oklahoma Steel Castings Co., Tulsa; and Chapter Secretary Emmett F. Hines, Nemco Foundry, Tulsa.

foundry facts

Quality Control/Nonferrous Castings

Causes of defect: (1) Most probable; (2) Second most probable, etc.

	DESIGN	PATTERN EQUIPMENT	MOLD SETTING	GATING	MOLDING	MOLDING SAND	CORES	METAL	MELTING	POURING
Core Blow: Excessively smooth depression area on inner surface of a cored casting or a gas pocket in the casting above the cored cavity.		Insufficient core print for venting. (3)			Inadequate venting from core print. (2)		Insufficient baking. Moisture pick up after baking. (1)			
Sand Sticking In Cored Cavities: An adherent coating of sand no evident "burning in," difficult to remove from small and remote internal cored cavities.							Improper or no core wash. (Rubber core wash may be used). Insufficient clay bond in core sand. (1)			
Surface Stains: Black discolorations of varying size and shape on surface of casting.					Excessive flour or molasses used on mold. (2)		Excessive molasses or other organic type of core wash. (1)	Excessively high alloyed iron. (3)		
Burning Into Sand: A rough sandy appearance of outer part of casting with some sand embedded in the surface.						Sand too coarse. Sand with too high permeability. Sand too dry. (2)		Excessive metal fluidity as from phosphorus. (1)		Excessive pouring temperature. (3)
Burning Into Cores: A rough sandy appearance of inner part of casting with some sand embedded in the inner surface or metal fins penetrating into core and holding grains of core sand.							Overbaked cores. Too rapidly baked cores. Poorly bonded cores. Insufficient clay bond in core sand. (2)	Excessive metal fluidity as from phosphorus. (1)		Excessive pouring temperatures. (3)
Weak Or Discontinuous Structure: A dendritic structure with minute cavities or voids between large crystals. Fractures (in bronze) badly discolored and granular non-fibrous in appearance.	Heavy sections adjoining light sections and impossible of being adequately fed. (5)			Inadequate gate requiring high pouring temperature. Inadequate feeding of heavy sections. (4)				Contamination of leaded alloys by silicon or aluminum. (2)	Gassing during melting. (1)	Excessive pouring temperature. (3)
Rough Or Pitted Surface: Rough surfaces on castings, some angular fairly deep pits but with no apparent sand, ash or crush.		Rough patterns. (5)			Careless molding leaving loose sand in cavity. (1)	Coarse particles of cores or metal in molding sand. (2)			Melting with highly fluid fluxes which cannot be skimmed off. (3)	Slag or dross allowed to enter sprue during pouring. (4)
Gas Holes: Spherical gas holes under or near surface of casting. Inside of gas cavities untarnished.	Inadequate fillets on pattern or excessively thin sections requiring excessively high pouring temperatures. (6)				Inadequate venting. (7)	Wet sand. Excessive new sand in sand mix. (3)	Poorly dried or poorly vented cores. (4)	Metal contamination as charged. Sulphur dioxide, hydrogen. (5)	Gas absorption during melting. Sulphur dioxide, hydrogen. (1)	Too high pouring temperature. (2)
Tin Or Lead Sweat: Spots, lumps or a thin layer of white metal on the surface of the casting.								Silicon or aluminum contamination in charge. (2)	Absorption of reducing gases during melting or holding. Silicon or aluminum contamination during melting. (1)	Excessive pouring temperatures coupled with high phosphorus. Metal not properly stirred previous to pouring. (3)
Solid Inclusions: Pieces of nonmetallic materials or separate particles of metal showing in the walls of the casting when fractured or machined.				Improper gating. (3)					Use of excessively fluid slags or fluxes. (2)	Careless or faulty skimming and pouring. (1)
Misrun: An incompletely filled mold cavity. Lugs or corners not filled out.			Insufficient height of sprue. (2)	Too small gate. (3)		Sand too wet. Low permeability of sand. (4)		Metal gassed sand contaminated with sulphur dioxide, oxygen or hydrogen. (6)	Metal gassed and made sluggish in melting. (5)	Interruption of pouring. Too cold metal. Too slow pour. (1)

Courtesy of Sam Tour & Co., Inc.

foundry facts

Quality Control/Nonferrous Castings

Causes of defect: (1) Most probable; (2) Second most probable, etc.

	DESIGN	PATTERN EQUIPMENT	MOLD SETTING	GATING	MOLDING	MOLDING SAND	CORES	METAL	MELTING	POURING
Shrinkage Cracks And Cavities: A crack or cavity formed by the metal pulling itself apart while cooling in the mold. The walls of these cracks and cavities are often discolored.	Adjacent position of heavy and light sections. Lack of fillets. (1)			Inadequate gating requiring excessive pouring temperature. Inadequate feeding of heavy sections. (2)				Metal contaminated with impurities which cause hot shortness. (4)		Excessive pouring temperatures. Too low a pouring temperature. (3)
Shift: A mismatch of the cope and drag at the parting line.		Loose, bent or poorly fitting dowel pins on flasks. (1)			Sand shift during roll over. (2)	Low flowability of sand causes ram-off. (3)				
Fins Or Strains: Excessive fins or flash along parting line.		Match plates thicker in the middle than near the edges. Match plates excessively flexible. Weak bottom boards. (1)	Improper placing of the mold on the pouring racks and improper or insufficient weighting of the mold. (3)		Excessive rapping of the pattern or match preparatory to withdrawal of the pattern. (2)		Improper match between molding sand and core. (4)			
Variation In Wall Thickness: A casting with wall thicknesses not as per drawing or specifications, too heavy, too light, or thick on one side and thin on the other.		Oversize cores (wear on core boxes). Oversize core prints allowing core float or shift. (1)			Excessive rapping of pattern resulting in oversize core print impressions. Uneven ramming of mold. (2)		Excessive shaving. Excessive coatings. Lifting due to insufficient reinforcement. (3)			
Cold Shut: Lack of joining of metal where two streams met leaving an apparent crack or a weakness which may result in a crack.			Insufficient pouring head. (3)	Inadequate gating. Restriction in the gate or runner. (1)	Insufficient venting. (5)	Wet sand. Low permeability of sand. (4)		Metal sluggish due to contamination in metal as charged or by contamination in the furnace. Sulphur, oxygen or gas. (7)	Improper melting resulting in gas absorption and sluggish metal. (6)	Metal too cold. Improper skimming allowing dross or slag to enter sprue. (2)
"Wormy" Surface: Irregular shallow elongated depressions in the vicinity of the gate, similar to worm tracks, often filled with zinc oxide. Sometimes accompanied with poor fractures.				Inadequate gating. (1)		Inadequate venting. (3)		Silicon or aluminum contamination of leaded alloys. Phosphorus additions to high zinc alloys. (2)		
Crush: A displacement of sand when closing the mold. Usually an irregular depression in the casting.		Core print too small for the core. (2)	Excessive weighting of mold. (3)		Carelessness on part of molder. (1)		Oversize cores. (4)			
Swell: A displacement of sand caused by pressure of molten metal. Usually a bulge on the cope side.			Insufficient weight on mold when poured. (2)		Too light ramming of cope. (1)					
Sand Wash: Rough lumps of metal at some points of casting and rough holes or depressions at other points.		Rough surface of patterns. Insufficient draft on patterns weakening of sand on withdrawal. (4)		Weak areas of sand around gate. Sharp corners at gate. (1)	Too light ramming. (2)	Weak sand (insufficient bond.) (3)	Overbaked core. Poorly bonded core. Core crush. (5)			
Scab: Rough, slightly raised areas on surface of casting often with some sand embedded.					Excessive density of sand due to too heavy ramming. (1)	Sand too fine. Lack of permeability. (2)				
Sand Blow: Excessively smooth depression area on outer surface of casting.				Excessive metal impingement on small area of sand. (3)	Insufficient venting. (1)	Sand too wet. Lack of permeability of sand. (2)				

afs | chapter meetings

MARCH

1 . . **Chesapeake** . . Engineers Club, Baltimore, Md. B. N. Ames, Columbia Bronze Corp., *"CO_2 Molding."*

1 . . **Mo-Kan** . . Fairfax Airport, Kansas City, Kansas. R. A. Clark, Electro Metallurgical Co. Div. UC&C, *"Charging Materials for Cupola Melting."*

1 . . **Western New York** . . Sheraton Hotel, Buffalo, New York. H. E. Henderson, Lynchburg Foundry Co., *Cupola Session.*

4 . . **Central Illinois** . . American Legion Hall, Peoria, Ill. W. H. Dawson, Ford Motor Co., *"Water Cooled Cupola."*

4 . . **Central Indiana** . . Athenaeum Turners, Indianapolis. A. G. Herman, Ajax Specialties Co., *"New Developments in Pattern Equipment."*

4 . . **Chicago** . . Chicago Bar Assn., Chicago. J. R. Young, Cadillac Motor Car Div. GMC, *"Automated Sand System."*

4 . . **Metropolitan** . . Essex House, Newark, N. J., W. B. Bishop, Archer-Daniels-Midland Co., *"Where Do We Go From Here In Core Making?"*

4 . . **Western Michigan** . . Schuler Hotel, Grand Haven, Mich. H. F. Scobie, Non-Ferrous Founders' Society, *"What's New in the Foundry."*

4 . . **Utah** . . Skyliner Cafe, Provo, Utah. *"Pattern Construction and Rigging."*

5 . . **Rochester** . . Seneca Hotel, Rochester, N. Y., R. Olson, Southern Precision Pattern Works, Inc., *"Jobbing With Shell Molds and Cores."*

6 . . **Toledo** . . Heather Downs Country Club, Toledo, Ohio. W. R. Weaver, Modern Pattern & Plastics, Inc., *"Use of Plastics in the Pattern Shop."*

7 . . **Canton District** . . Mergus Restaurant, Canton, Ohio. H. Kessler, Sorbo-Mat Process Engineers, *"Cupola."*

7 . . **Saginaw Valley** . . Fischer's Hotel, Frankenmuth, Mich. *Student Activities Night.*

8 . . **Chesapeake, Southern Section** . . Hotel O'Henry, Greensboro, N. C., H. R. Fisher, *"Injecting and Upgrading Iron."*

8 . . **Corn Belt** . . Fireside Restaurant, Omaha, Nebraska. M. Bock II, Exomet, Inc., *"Aluminum."*

8 . . **Eastern Canada** . . Sheraton-Mount Royal Hotel, Montreal. *Stump the Experts Night. (Prizes.)*

8 . . **Mid-South** . . Hotel Claridge, Memphis, Tenn. C. V. Nass, Beardsley & Piper Div. Pettibone Mulliken Corp., *"Mechanization in the Foundry."*

8 . . **Philadelphia** . . Dobbins Vocational School, Philadelphia. Prof. W. H. Ruten, Polytechnic Institute of Brooklyn, *"The Foundry Is A Good Place To Work."*

8 . . **Wisconsin** . . Hotel Schroeder, Milwaukee. *Management Night, Ladies Invited.* Dean C. E. Manion, *"The Management of Freedom."*

9 . . **Northeastern Ohio** . . Tudor Arms Hotel, Cleveland. *Ladies' Night.*

11 . . **Central Ohio and Cincinnati District** . . Suttmiller's Restaurant, Dayton, Ohio. Joint meeting. F. G. Steinebach, Penton Publishing Co., *"Can We Sell More Castings?"*

11 . . **Michiana** . . Club Normandy, Mishawaka, Ind. Dr. R. A. Flinn, University of Michigan, *"Relation of Casting Structure to Service Performance."*

11 . . **Timberline** . . Oxford Hotel, Denver, Colo. *Aluminum Foundry Practice.*

12 . . **No. Ill.-So. Wis.** . . Beloit Country Club, Beloit, Wis. T. E. Barlow, Eastern Clay Products Dept., International Minerals & Chemicals Corp., *"High Pressure Molding."*

12 . . **Twin City** . . The Covered Wagon, Minneapolis. J .Hetland, University of Minnesota, *"Legal Aspects Pertaining to Business Enterprises."*

13 . . **New England** . . University Club, Boston. F. H. Dettore, G. E. Smith, Inc., *"Kold-Set Process Binder."*

14 . . **Washington** . . Meeting plans not completed.

14 . . **St. Louis** . . York Hotel, St. Louis. R. H. Jacoby, St. Louis Coke and Foundry Supply Co., *"Casting Quality." Pattern Apprentice Night.*

15 . . **Birmingham District** . . Anniston, Ala. W. A. Hambley, Charles A. Krause Milling Co., *"Scrap—Whose Responsibility?"*

15 . . **British Columbia** . . No meeting because of special educational program at Vancouver Vocational School.

15 . . **Texas** . . Hilton Hotel, Fort Worth, Tex. A. St. Clair, Fanner Mfg. Co., *"Chaplets."*

15 . . **Tri-State** . . Alvin Hotel, Tulsa, Okla. F. Newberry, Oklahoma Steel

Castings Co., *"Pad Washing with Carbon Arc Process."*

15-16 . . Southern California and **Northern California** . . Claremont Hotel, Berkeley, Calif. *No regular meeting. California Regional Foundry Conference, AFS.*

18 . . Pittsburgh . . Webster Hall Hotel, Pittsburgh, Pa., H. H. Kessler, Sorbo-Mat Process Engineers, *"Gating & Risering."*

18 . . Quad City . . Hotel Ft. Armstrong, Rock Island, Ill. C. L. Schwyhart, Caterpillar Tractor Co., *"Supervisor Development."* Management Night.

19 . . Eastern New York . . Panetta's Restaurant, Menands, N. Y. Prof. H. F. Taylor, Massachusetts Institute of Technology, *"Food for Thought."*

20 . . Central Michigan . . Hart Hotel, Battle Creek, Mich. W. R. Jaeschke, Whiting Corp., *"Good Cupola Practice."*

20 . . Oregon . . Heathman Hotel, Portland, Ore. *Apprentice Contest.*

21 . . Detroit . . Tuller Hotel, Detroit. *AFS Apprentice Contest Results, Youth Night and Plant Visitation, Great Lakes Steel Corp.*

22 . . Ontario . . Royal York Hotel, Toronto. A. D. Barczak, Superior Foundry, Inc., *"Pneumatic Sand Reclamation."*

22 . . Tennessee . . Patten Hotel, Chattanooga, Tenn. H. W. Northrup, International Nickel Co., *"Ductile Iron."*

25 . . Northwestern Pennsylvania . . Amity Inn, Erie, Pa. Dr. R. F. Thomson, Research Laboratory Div. GMC, *"Planning for the 20th Century Foundry."*

29 . . Chesapeake . . Engineers Club, Baltimore, Md. V. M. Rowell, Harry W. Dietert Co., *"Sand Testing and Good Sand Control for Making Better Cores."*

Connecticut . . No information available.

Central New York . . No information available.

Mexico City . . No information available.

APRIL

1 . . Central Illinois . . American Legion Hall, Peoria, Ill. M. Bock, II, Exomet, Inc., *"Exothermic and Insulating Materials."*

1 . . Central Indiana . . Athenaeum Turners, Indianapolis. B. A. Lawson, Harrison Steel Cstgs. Co.; S. Hodler, Golden Foundry Co.; H. Frank, Franks Foundry; T. E. Smith, Central Foundry Div. GMC; E. O. Spahr, National Malleable & Steel Cstg. Co.; S. G. Johnson, Jr., International Harvester Co. *"Control of Quality in the Foundry."*

1 . . Chicago . . Chicago Bar Assn., Chicago. Gray Iron Div.: H. H. Hursen, Griffin Wheel Co., *Film Showing the "Unusual" in Foundry Practices;* Malleable & Patterns Div.: R. Cech, National Malleable & Steel Castings Co., *"Gating and Risering;"* Steel & Maintenance Div.: R. Sexton, International Harvester Co., Mfg. Research Dept., *"Powder Cutting & Washing Technique;"* Non-Ferrous Div.: R. Cochran, R. Lavin & Sons, Inc., *"Melting of Non-Ferrous."*

1 . . Metropolitan . . Essex House, Newark, N. J. *Developments in Atomic Energy.*

1 . . Western Michigan . . Fingers, Grand Rapids, Mich. *Round Table, Foundry Scrap.*

2 . . Rochester . . Seneca Hotel, Rochester, N. Y., J. J. Watson, C. O. Bartlett & Snow Co., *"Modern Foundry Design Trends."*

4 . . Canton District . . Elks Club, Alliance, Ohio. K. A. Kirby, Caterpillar Tractor Co., *"Foremen Training." National Officers' Night.*

4 . . Saginaw Valley . . Fischer's Hotel, Frankenmuth, Mich. W. G. Ferrell, Auto Specialties Mfg. Co., *"How Health and Hygiene Affect Foundry Cost."*

5 . . Corn Belt . . Fireside Restaurant, Omaha, Neb. W A.. Hambley, Chas. A. Krause Milling Co., *"Casting Defects."*

5 . . Mo-Kan . . *Plant Visitation and Panel Discussion.*

8 . . Central Ohio . . Seneca Hotel, Columbus, Ohio. M. J. Kellner, Trafford Foundry Div., Westinghouse Corp., *"A Practical Approach to a Profitable Foundry."*

8 . . Michiana . . Spaulding Hotel, Michigan City, Ind.

8 . . Timberline . . Oxford Hotel, Denver, Colo. W. A. Hambley, Chas. A. Krause Milling Co., *"Casting Defects or Quality Control."*

9 . . Eastern New York . . Panetta's Restaurant, Menands, N. Y. *Annual Joint Meeting with A.S.M.*

9 . . No. Ill.-So. Wis. . . Lafayette Hotel, Rockford, Ill. B. H. Taylor, Union Relations Div. B. F. Goodrich Co., *"Today's Challenge in Human Relations."*

9 . . Twin City . . The Covered Wagon, Minneapolis. H. F. Scobie, Non-Ferrous Founders' Society, *"Future Foundry Trends."*

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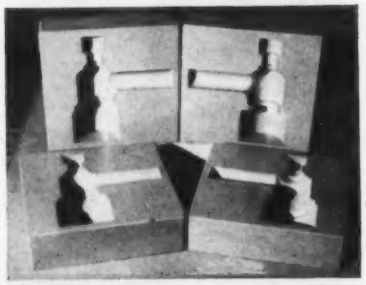
16 HOURS VS. 65 HOURS



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Modernization, Processing Layouts
Cost Reduction Quality Control
Product—Machine Control
Architectural Design
One North La Salle St., Chicago 2, Ill.

afs chapter meetings

Continued from page 85

11 . . Northeastern Ohio . . Tudor Arms Hotel, Cleveland. *National Officers' Night, Apprentice Awards.*

11 . . St. Louis . . York Hotel, St. Louis. C. A. Sanders, American Colloid Co., *"What Sand for What Type Casting?"*

12 . . Eastern Canada . . Sheraton-Mount Royal Hotel, Montreal. *"The Value of Nickel in Cast Metals."*

12 . . Mid-South . . Hotel Claridge, Memphis, Tenn. L. P. Beaver, Beaver Welding Supply Co., *"Welding of Gray Iron Castings."*

12 . . Southern California . . Rodger Young Auditorium, Los Angeles. L. W. Eastwood, Kaiser Aluminum & Chemical Corp., *"Non-Ferrous Castings Practice."*

12 . . Wisconsin . . Schroeder Hotel, Milwaukee. Sectional Meeting. Non-ferrous Group: D. L. LaVelle, Kaiser Alum. & Chem. Sales, Inc., *"Aluminum Casting Defects and Their Correction;"* Gray Iron Group: V. G. Winget, Reda Pump Co.; *"Melting of Gray Iron in Reverberatory Furnace;"* Malleable Group: C. A. Sanders, American Colloid Co., *"Malleable Molding Sands:"* Steel Group: H. F. Taylor, Massachusetts Institute of Technology, *"Mold-Metal Interface Reaction."*

12-13 . . Chesapeake and **Philadelphia . .** Benjamin Franklin Hotel, Philadelphia, *AFS East Coast Regional Conference.*

15 . . Pittsburgh . . Webster Hall Hotel, Pittsburgh, Pa., W. O. Philbrook, Metals Rsch. Laboratory, Carnegie Institute of Technology, *"Solidification of Steel Castings."*

15 . . Quad-City . . Hotel Ft. Armstrong, Rock Island, Ill. G. P. Phillips, Foundry Research, International Harvester Co., *"Shell Processes—Molding and Cores."*

17 . . Central Michigan . . Hart Hotel, Battle Creek, Mich. E. H. King, Hill & Griffith Co., *"Molding Sand and Molding Methods."*

17 . . Oregon . . Heathman Hotel, Portland, Ore. Dr. L. W. Eastwood, Kaiser Alum. & Chem. Corp., *"Non-Ferrous Foundry Practice."*

19 . . Birmingham District . . University of Alabama, Birmingham, Ala. *Foundry Demonstrations, Luncheon, Educational Sessions.*

19 . . British Columbia . . Pacific Athletic Club, Vancouver. L. W. Eastwood, Kaiser Aluminum & Chemical Corp., *"Non-Ferrous Castings Practice."*

19 . . Texas . . Angelina Hotel, Lufkin, Texas. Practical Castings Clinic. A. E. Stanfield, Lufkin Foundry & Machine Co., *Safety Discussion.*

22 . . Northwestern Pennsylvania . . D. E. Krause, Gray Iron Research Institute.

26 . . Chesapeake . . Engineers Club, Baltimore, Md. W. S. Thomas, Emmaus Foundry & Machine Co., *"What the Customer Expects in His Castings."*

26 . . Ontario . . Royal Connaught Hotel, Hamilton. *Ladies' Night.*

26 . . Tennessee . . Patten Hotel, Chattanooga, Tenn. *Management Night.*

27 . . Western New York . . Trap and Field Club, Buffalo, N. Y. *Ladies' Night. Annual Spring Dance.*

29 . . Chicago . . Chicago Bar Assn., Chicago. C. F. Christopher, Continental Foundry & Machine Co., *"Excuses and Alibis for Poor Casting."*

casting through the ages

advertisers and their agencies

This index is published as a convenience to the readers. While every care is taken to make it accurate MODERN CASTINGS assumes no responsibility for errors or omissions.

What About Cars in 1980?

Increasing horsepower with more efficient operation was forecast for the automobile of the future by A. L. Boegehold, manager of research staff activities of the GMC Research Staff at the January meeting of the American Foundrymen's Society Chicago Chapter. Boegehold also cited figures showing that by 1980 there would be fewer passengers per car with an increase in both miles per car and person.

Statistics for the car of the future as presented by Boegehold:

	1930	1940	1955	1980
Passengers/auto	5.3	4.8	3.2	2.5
Av. miles/car/year	7200	9200	9600	12,000
Miles/year/person	1300	1900	3000	4800
Av. hp/car	75	125	180	250
Miles/gal @ 40 mph	15	18	20	30
Gals/fuel (billion)	14	21	46	84

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modern castings